

MAMMOMAT 1000/3000/3000 Nova

SP

Installation

Installation Instructions

Upgrade of AEC-mode (including Fuji)
and OPDOSE for M1000

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Chapter	Page	Revision
All	All	06

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General

These instructions describe installation of both, the upgrade kit no. 65 52 819 and of the upgrade kit no. 65 52 801. Both kits make also Fuji correction tables, and - for the MAMMOMAT 1000 - the OPDOSE feature available.

The **upgrade of AEC-mode (kit no. 65 52 819)** will improve the accuracy and the handling of new film/screen combinations in the MAMMOMAT 1000/3000/3000 Nova. The kit includes a new AEC board D701 and software (firmware).

The upgrade kit no. 65 52 801 includes only new software/firmware.

The AEC is based on correction tables (Look Up Tables). The tables are optimized for the film/screen combinations shown in Table 1. Tube current reduction is not available.

The tolerances of the AEC are specified for incremental gamma ≤ 5 .

Table 1				Correction table identifications		
Film	Screen	Cassette	Sensitivity	Mo/Mo	Mo/Rh	W/Rh
Kodak Min-R 2000	Kodak Min-R 2000	Kodak Min-R 2	0	1004	1005	1006
Kodak Min-R 2000	Kodak 2190	Kodak Min-R 2	0	1004	1005	1006
Kodak Min-R EV	Kodak EV 150	Kodak Min-R 2	0	1004	1005	1006
Kodak Min-R EV	Kodak EV 190	Kodak Min-R 2	0	1004	1005	1006
AGFA HDR	AGFA HD S	AGFA Mammoray	0	1004	1005	1006
AGFA HDR C	AGFA HD S	AGFA Mammoray	0	1104	1105	1106
AGFA HDR C Plus	AGFA HD S	AGFA Mammoray	0	1104	1105	1106
Fuji AD-M	Fuji AD Medium	Fuji EC-MA	0	1201	1202	1203

For Sterling, the correction table for Kodak Min-R 2000 is recommended.

The indications of this table are meant as recommendations. In case of failure the calibration of AEC with other series of correction tables may be attempted.

NOTE

If the film/screen combination in question is not listed in Table 1, the correction tables for one of the listed combinations will have to be used, although the tolerances for OD variation then cannot be guaranteed.

Primarily, use the correction tables for Kodak Min-R 2000 if the film/screen in question is a Kodak etc.

Prerequisites (for the Upgrade kit no. 65 52 819)

Depending on the serial number and/or version of the software of your MAMMOMAT, complementary measures may have to be taken. These measures are described below.

For MAMMOMAT 3000 with serial number lower than 2056

- If not done previously; change the polarity of the stereo lever switch and follow the procedure described in Appendix 1.

For MAMMOMAT 3000 with serial number lower than 3242

- Make sure that the article no. of the PC board D702 is 64 21 288.

For MAMMOMAT 3000 software version lower than v1.5

- Replace HSE detectors. The part no. of the HSE detectors must be 38 47 626.

For MAMMOMAT 3000 software version lower than v2.2

- Calibrate the swivel-arm rotation as described in Appendix 2.

Prerequisites (for the Upgrade kit no. 65 52 801)

- Software/Firmware version 4.0/4.1, which means that the "new" AEC and the D701 = 6447754 are already installed (if not, the Upgrade kit no. 65 52 819 has to be used).

Tools required

- AEC calibration plexi, also called Plexi, comprising:
 - Three plates, (part no. 65 61 232)
 - One plate, (part no. 65 61 224)
- Digital voltmeter (Fluke type 8060A, part no. 97 02 101 Y4290, or Fluke type 87, part no. 97 03 976 Y4290)
- Service PC (e.g. Siemens Nixdorf PCD3-NSX/20 or similar) with connecting cable (PC - Generator), part no. 99 00 440 RE999
- Sensitometer, e.g. X-Rite 333, part no. 97 02 424 Y 1996
- Densitometer, e.g. X-Rite 331, part no. 97 02 416 Y 1996
- Calculator
- Standard tool kit
- Anti-Electro Static Discharge (ESD) tools
- Loctite 242 (for the installation kit no. 65 52 819 only)

Components included

The Upgrade kit no. 65 52 819 is comprising

Article	Quantity	Part no.
Installation material, kit	1	64 83 874
AEC Calibration Plate, standard	1	65 52 728
AEC Calibration Plate (magnification 1,5/1,8)	1	65 61 026
PC board D701, AEC	1	64 47 754
Floppy with Service PC Program V4.4, VA00A	1	66 09 528
Floppy with AEC correction tables V1.2, VA00A	1	65 19 289
Stand PROM - V4.5 - D801 / I 9	1	66 09 601
Generator PROM kit - V4.5: Control Panel PROM D740 / I 10 AEC PROM D701 / IC7 Master PROM D702 / J 39	1	66 09 619
Empty floppy disks for backup copies	4	60 01 486
Label "mAs / mGy"	1	66 07 993
Label with part no. and serial no.	1	34 14 323
Installation Instructions (this document) (SPB7-230.031.15.06...;)	1	(66 31 456)
Instructions for Use M1000/3000 Nova (Engl.) (SPB7-230.201.08.04...;)	1	

Article	Quantity	Part no.
Supplement to Instructions for Use (English) (SPB7-230.203.05.01...)	1	(65 19 727)
Supplement to Instructions for Use (German) (SPB7-230.203.05.01...;)	1	(65 58 857)
Supplement to Instructions for Use (French) (SPB7-230.203.05.01...;)	1	(65 58 865)
Supplement to Instructions for Use (Spanish) (SPB7-230.203.05.01...;)	1	(65 58 873)
Supplement to Instructions for Use (Swedish) ((SPB7-230.203.05.01...;)	1	(65 58 881)
Supplement to Instructions for Use (Italian) (SPB7-230.203.05.01...;)	1	(65 58 899)
Service Program, from SW V4.0; (SPB7-230.114.03.05.02...;)	1	(66 30 896)
Supplement to Wiring Diagrams, (SPB7-230.051.08.01...;)	1	(65 27 423)

Installation material no. 64 83 874 comprising

Article	Quantity	Part no.
Grid mask	1	64 83 189
Mask holder	1	64 83 197
Insulating plate	1	64 83 205
Stop bracket	1	64 83 213
Screw MFX, 3x6	10	64 61 789
Screw RXK ST4, 2x13	2	61 87 897
Nut SNM ST4, 2-17, 2	2	60 34 698
Screw MC6S, 5x12	2	60 23 444
Screw MC6S, 5x30	2	60 23 584
Nut M6M 3	4	60 33 989
Washer BRB 3, 2x7	4	61 68 251
Nut M6NY 4	2	60 34 565
Washer BRB 4, 3x9	2	61 68 269
Label	2	64 55 398

NOTE

The same kinds of screws, nuts and washers as the ones presently used, are included in the kit. Replace the old ones if necessary.

NOTE

Upgrade of AEC-mode also involves replacement of plastic trays of compression plates, with detector markings.

The Upgrade kit no. 65 52 801 is comprising

Article	Quantity	Part no.
Floppy with Service PC Program V4.4, VA00A	1	66 09 528
Floppy with AEC correction tables V1.2, VA00A	1	65 19 289
Stand PROM D801 / I 9 - V4.5 - D801 / I9	1	66 09 601
Generator PROM kit - V4.5: Control Panel PROM D740 / I 10 AEC PROM D701 / IC7 Master PROM D702 / J 39	1	666 09 619
Empty floppy disks for backup copies	2	60 01 486
Installation Instructions (this document) (SPB7-230.031.15.06...;)	1	(66 31 456)
Instructions for Use M1000/3000 Nova (English) (SPB7-230.201.08.04...;)	1	
Service Program from SW V4.0 (SPB7-230.114.03.05.02...;)	1	(66 30 896)

Documents required for the installed MAMMOMAT

- Wiring diagrams MAMMOMAT
- Installation and Start-Up Instructions
- Operating Instructions
-

Documents required

- MAMMOMAT Wiring diagrams, SPB7-230.051.07...;
- Service, Replacement of parts - Compression Plates, SPB7-230.841.01.03....;

Handling of "Instructions for Use"

Applicable version of "Instructions for Use" depends on the serial no. for the MAMMOMAT in use and the installation kit no.

New "Instructions for Use" refers to the document with print no. SPB7-230.201.08.04... (included in the installation kit no. 65 52 801 and 65 52 819). "Supplement to Instructions for Use" refers to the document with print no. SPB7-230.203.05.01...

Beside of Hardware and software/firmware for upgrade of the AEC the Upgrade kit 6552819 contains:

the Software "Calculated absorbed glandular dose program" (option), which is being supplied with Mammomats as of Serial Number > 9000, (this has to be enabled via Service PC), and

the Firmware V4.5 (with an Add-on "Communication with Digiscan M), which is being supplied in Mammomats as of Serial Number > 9300.

However, the kits do not contain the Printer Label configuration program 66 09 544 (Version 1.2) needed to configure the printer, i.e. the layout of labels, to display not only the mAs but the calculated absorbed dose, as well.,.

Mammomat	Serial no.	Installation kit no.	Keep	Keep only as reference
M3000 Nova	≥ 7100	65 52 801	old "Instructions for Use"	new "Instructions for Use"
M3000	≥ 7000	65 52 801	old "Instructions for Use"	new "Instructions for Use"
		< 7000	old "Instructions for Use"	new "Instructions for Use"
		65 52 819	new "Instructions for Use" and "Supplement to Instructions for Use"	old "Instructions for Use"
M1000	≥ 7000	65 52 801	new "Instructions for Use"	old "Instructions for Use"
	<7000	65 52 801	new "Instructions for Use"	old "Instructions for Use"
		65 52 819	new "Instructions for Use" and "Supplement to Instructions for Use"	old "Instructions for Use"

Time required

The installation time depends on the configuration of the MAMMOMAT.

AEC upgrade kit no. 65 52 819

Basic model with one wing, one anode / filter and one object table	Approximately 8 hours
--	-----------------------

Configuration	Time to add to basic model
An extra wing	1 hour
Each extra object table in addition to the 18x24 bucky	1 hour x number of anodes & filters

Upgrade kit no. 65 52 801

Upgrading M1000 with OPDOSE only takes approximately 2.5 hours.

Upgrading M1000/3000/3000 Nova with Fuji correction table:

Basic model with one wing, one anode/filter and one object table	Approximately 6 hours
--	-----------------------

Configuration	Time to add to basic model
Each extra object table in addition to the 18x24 bucky	1 hour x number of anodes & filters

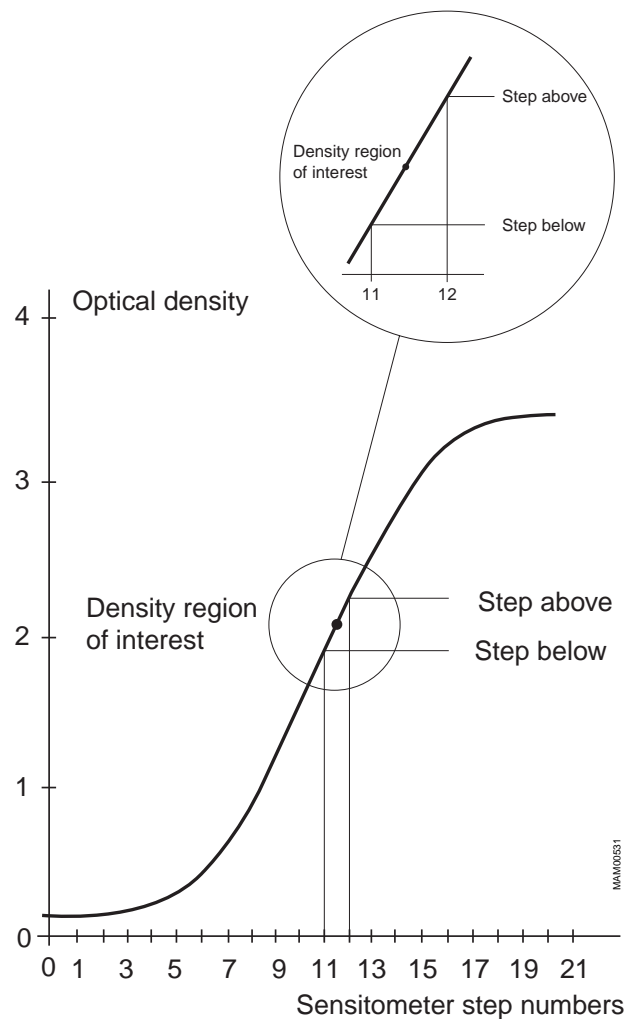
Definitions

Incremental gamma

is defined as the slope of the gamma curve in the density region of interest.

On the sensitometer strip it means that:

Incremental gamma = (blackening on the step closest above density region of interest - blackening on the step closest below that step) / 0.15



Old service PC program

The PC program in use prior to the installation.

New service PC program

The PC program included in the installation kit.

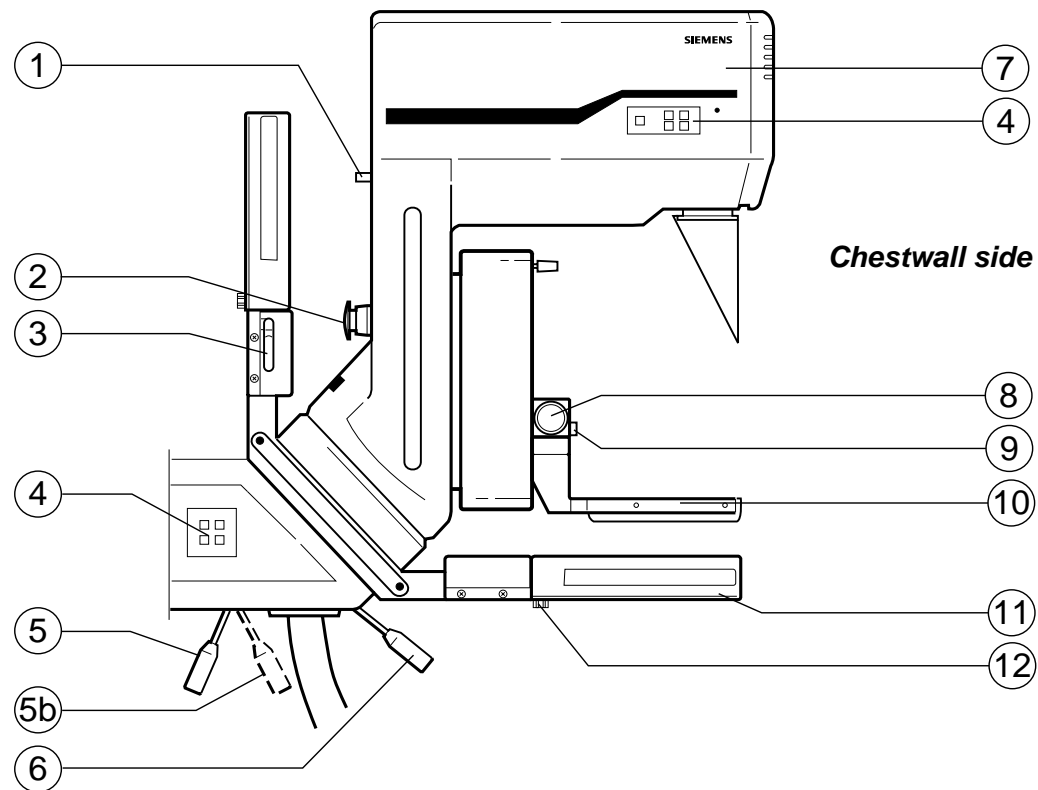
Old backup floppy disk

Backup floppy disk to store data from before the installation. To be marked "Old backup" and with serial no. of system, date, and version of service program.

New backup floppy disk

Backup floppy disk to store data during and after the installation. To be marked "New backup" and with serial no. of system, date, and version of service program.

Overview



8MAM00530

- | | |
|--|--|
| 1 Knob for presetting the projection angle | 7 X-ray tube assembly with collimator |
| 2 Emergency-stop | 8 Knob for manual compression/decompression |
| 3 Lever for releasing/locking the object table | 9 Button for releasing the compression plate |
| 4 Buttons for adjusting height and rotating the swivelarm system | 10 Compression plate |
| 5 Stereo lever in stereotactic mode | 11 Base plate with installed object table |
| 5b Stereo lever in normal mode | 12 Lever for positioning the AEC detector |
| 6 Lever for releasing the rotation of the object-table arm | |

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Protective measures

It is very important that any intervention in the equipment will start with disconnecting it from the power supply with the main circuit-breaker. Before removing or inserting any of the printed circuit board, switch of the equipment. To prevent accidental triggering of high voltage and radiation, set the switch S2 (SS) on p.c. board D702 to "OFF" (lower position, no triggering of the SS relay).

WARNING

If the system is only switched off at the control panel or with S2/D711, line voltage will still be present at the generator line connection, line filter Z1, Z2, transformer T1, transformer T10 and p.c. board D711 (see wiring diagram).

Life-threatening electric shock hazard exists.

Disconnect mains cable and comply with the information on this page.

WARNING

After shut-down of the system, there may still be 380 V DC present on the intermediate circuit.

Life-threatening electric shock hazard exists.

The voltage level will be indicated by LED V24 on PC board D710. The voltage will drop to less than 30 V within about 3 minutes, the LED goes out at about 30 V.

WARNING

The edges of the metal curtain of the stand are very sharp. They may cause severe injury.

Apply the protective strips as mentioned in section "Protective strips for the metal curtain" in the document "Installation and Start-up Instructions" after removing the covers from the stand. Remove the protective strips only when the covers are to be mounted or when vertical adjustment of the swivel-arm system is necessary.

CAUTION

The p.c. boards contain electrostatic highly sensitive components.

If not regarded, the components could be damaged.

Use ESD-equipment, ground prior to making contact and place the components on a conductive surface.



This symbol indicates exposure of X-ray radiation.

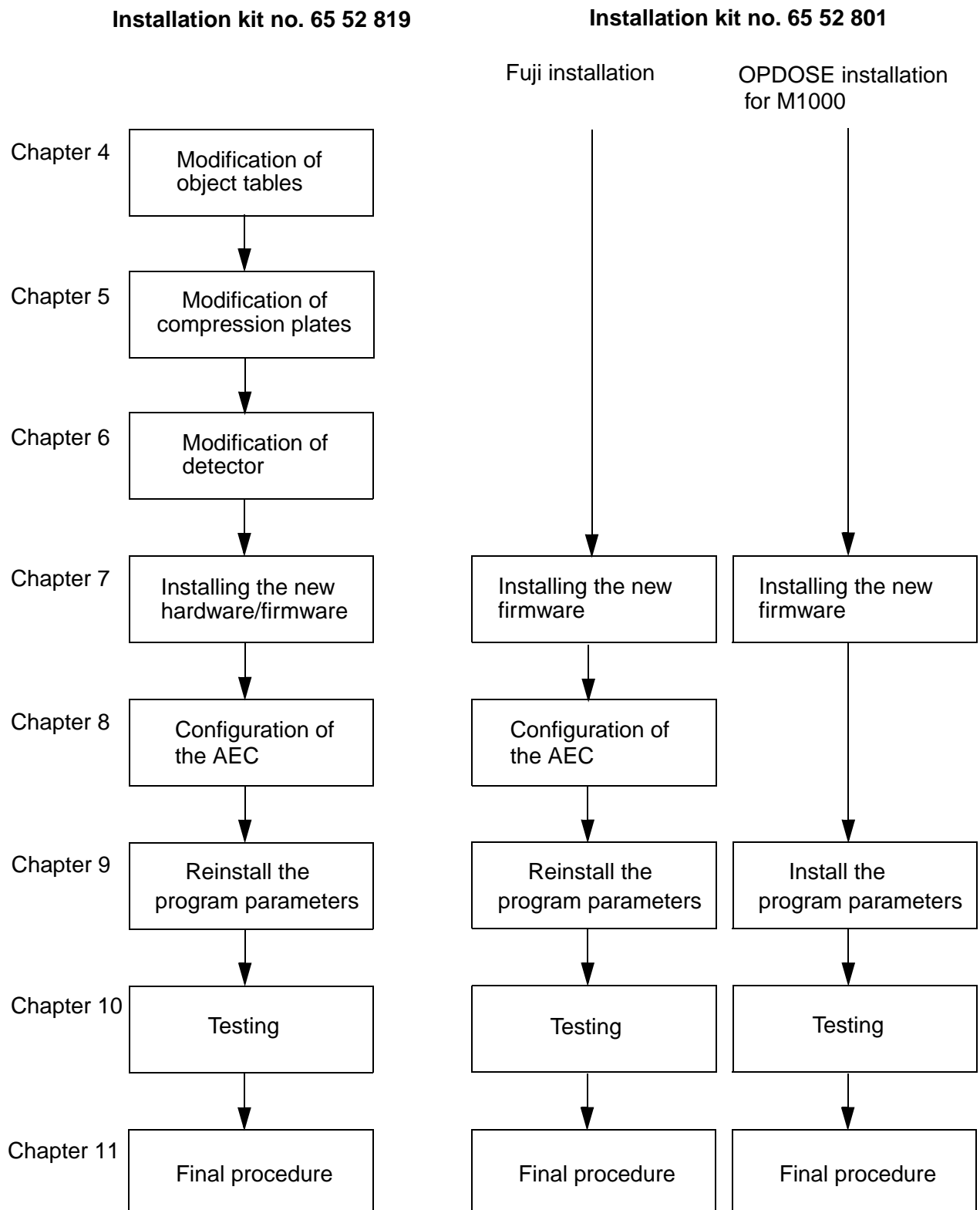
Delay times between two exposures

Delay times listed below must be followed in order to prevent the tube from overheating.

Exposure mAs value	Delay time between two exposures (seconds)
max 100	min 15
max 200	min 30
max 300	min 45
max 400	min 60
max 500	min 75

Overview of necessary procedures

An overview of the necessary procedures described in these Installation instructions:



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Modification of object tables

This instruction describes *when* and *how* to *remove the grid bars* of the object tables listed below.

Object tables affected

This instruction is valid for the used object tables (one or all):

- 24 cm x 30 cm with reciprocating grid (bucky)
- 18 cm x 24 cm with reciprocating grid (bucky)
- Magnification table for 18 cm x 24 cm (magnification factor 1.8 or 1.5)
- 24 cm x 30 cm without grid (cassette holder)
- 18 cm x 24 cm without grid (cassette holder)

Preliminaries

Turn the object table upside down.

To protect against scratches, cover the internal grid plate surface with paper or similar.

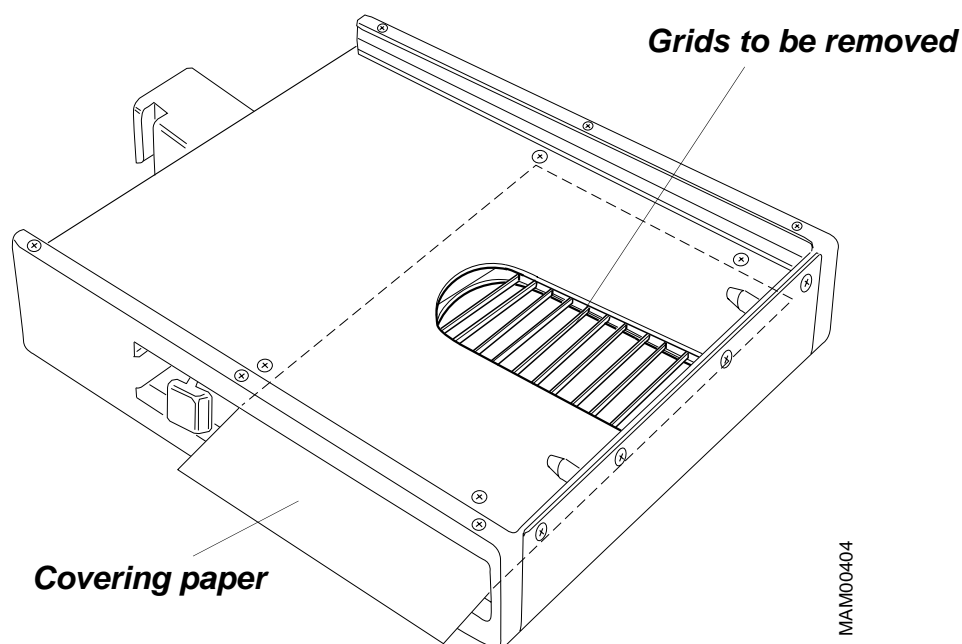


Fig. 1 Object table with covering paper

Grab a grid bar with a pair of flat pliers and twist the bar in order to deform it. Continue twisting until the grid bar can easily be removed from the object table.

MAM000405

NOTE

It is important not to use more force than necessary when removing the grid bars from the object table, because of the risk of slipping.

Compression plates affected

This modification is valid for *all* plates with detector markings. For further instructions on replacement of plastic trays of compression plates, see the document "Replacement of Parts, Compression plates".

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Removing the base-plate cover

1. Mains voltage and system OFF.
2. Loosen the two screws (1/Fig. 1) to remove the cover over the table locking device.

⚠ WARNING

Risk of injury!

When loosen the table locking device, edges may be sharp.

⚠ CAUTION

Be careful not to damage the thin wires to the contact for the object tables.

3. Loosen the four screws (2 and 3/Fig. 1) to loosen the table locking device from the base plate.
4. Loosen the ten screws (4/Fig. 1) and remove the base-plate cover. The detector is now accessible.
5. Move the base-plate cover to the side.
6. Disconnect the cable X883 or X884 (5/Fig. 1) from the detector.
7. Unscrew the four nuts (6/Fig. 1) and lift up detector with insulating plate. Loosen the three screws (7/Fig. 1) to remove the detector from the insulating plate.

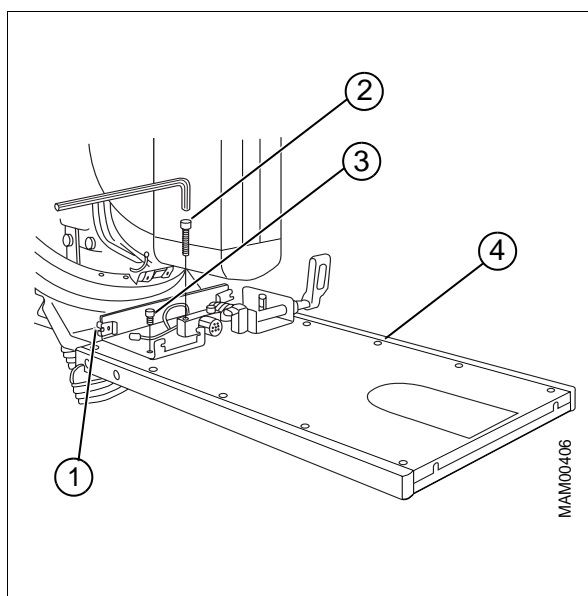
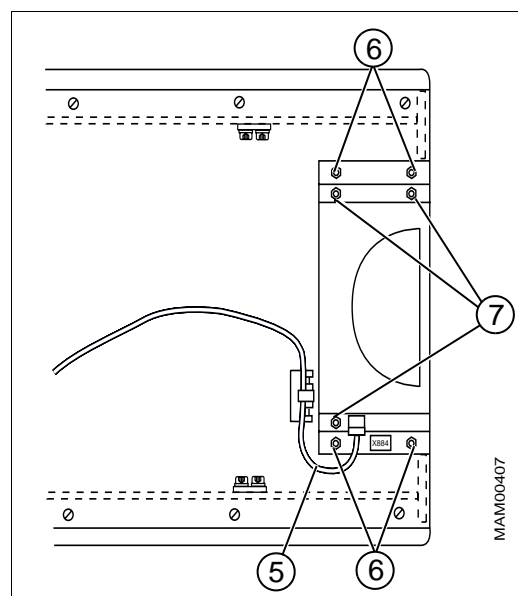


Fig. 1



Mounting the detector mask

1. Remove the nuts and the washers on the bottom side of the base plate cover (1/ Fig. 2).
2. Remove the z-shaped stop bracket (2/ Fig. 2).
3. Mount the new stop bracket (3/ Fig. 2) which is included in the kit. Fasten the nuts (4/ Fig. 2).

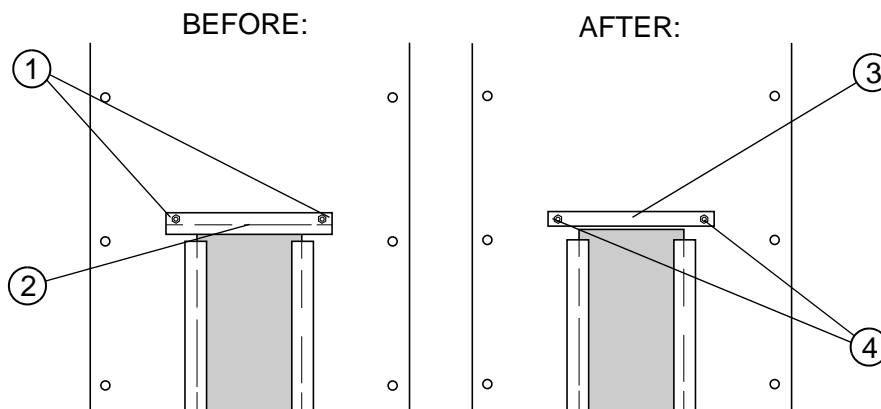


Fig. 2 Underneath the lid

4. Place the new insulating plate, which is included in the kit, on the four fixed screws (1/ Fig. 3).
5. Place the detector (2/ Fig. 3) on the new insulating plate (3/ Fig. 3).
6. Place the grid mask (4/ Fig. 3), which is included in the kit, on the detector.
7. Place the mask holder (5/ Fig. 3), which is included in the kit, on top of the grid mask. Center the holes on the mask holder on top of the screws (1/ Fig. 3). This will fix the grid mask on the detector.

NOTE

The same kinds of screws, nuts and washers as the ones presently used, are included in the kit. Replace the old ones if necessary.

-

9. Mount the X883 or X884 label (6/Fig. 3) on the mask holder.
10. Check the functioning of the AEC detector positioning levers.
11. The detector should be easy to position. The friction can be adjusted by raising the four nylon pads (7/Fig. 3).

Do not remove or replace the grease that is lubricating the detector movement.

- Make sure that the spring of the lever for locking/releasing the object table is correctly mounted.**

- If the unit is equipped with a mask to decrease the detector area;
remove mask and maskholder.**

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Backup of existing system -

1. Mains Voltage and system **OFF** ! Open the generator by removing the front cover as follows: Pry loose the plastic strips (1/fig. 1) on both sides, using a screwdriver or similar tool. Loosen the sixteen screws (2/fig. 1) now accessible (eight on either side) and remove the front cover (3/fig. 1).

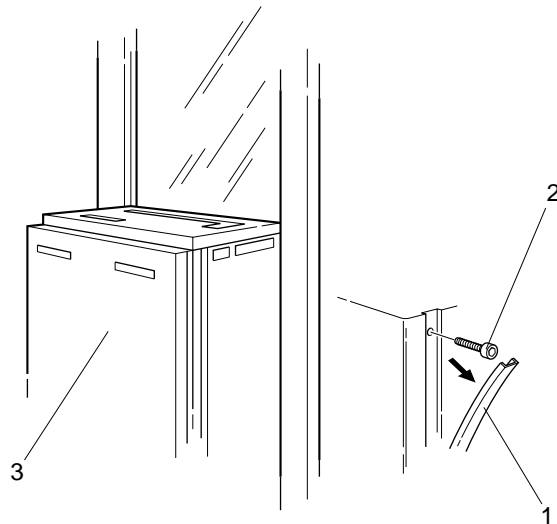


Fig. 1

MAN00204

NOTE

Be sure to keep the contact washers (there are four contact washers on either side). They will be needed again when reassembling the front cover, to establish protective ground connection.

2. Connect the service PC to the generator.
3. Mains voltage and system ON.
4. Start up the old service PC program as follows:
 - Insert the old Service PC floppy.
 - Start the service program from DOS-environment.
 - In the log in-menu, enter your name and press <ENTER>.
 - Type the password for the service PC program and press <ENTER>.
 - In Program-mode set: **normal**.
5. Check that the correct version of the service PC program is used. The version is shown in the top left corner of the display.
6. In <Mainmenu> select <Configuration> and <Power>. Note the displayed power values in the test protocol on Page T - 1.
7. Take out the floppy with the old service PC program and insert an empty floppy disk and mark it with **old backup**, serial number of system, version of service program, and the day's date. This floppy is defined as **old backup floppy**.
8. In <Mainmenu> select <Backup>, <Copy installation to floppy> and <All>.
9. In <Mainmenu> select <Configuration>, <Save config file>. Press <F2> to save.
10. In <Mainmenu> select <Service>, <Copy error buffer to file>.

11. If the MAMMOMAT is equipped with OPDOSE, press the kV button on the control panel. (1/Fig. 1 in chapter 10.) Note the displayed exposure settings in the test protocol T-1 (Page 13 -1, in the column "Breast thickness"). Repeat for all four programs. Then enter menu <Configuration>, <Miscellaneous> and <Auto limits>. Note the three values in test protocol T-1, in the Table "Auto limits".
12. Quit the service program by pressing <F10>.
13. Check that the following backup files are stored on this floppy disk (by typing "a:", then pressing <ENTER> and typing "dir"):

In case of upgrade kit no. 65 52 819:

- i_backup.txt for AEC parameters
- s_backup.txt for stand parameters
- p_backup.txt for panel parameters
- mammo.cfg for configuration parameters

In case of upgrade kit no. 65 52 801:

- a_backup.txt for AEC parameters
- s_backup.txt for stand parameters
- p_backup.txt for panel parameters
- momo_h.txt for AEC correction tables
- morh_h.txt for AEC correction tables
- wrh_h.txt for AEC correction tables
- momo_d.txt for AEC correction tables
- morh_d.txt for AEC correction tables
- wrh_d.txt for AEC correction tables
- mammo.cfg for configuration parameters

14. Remove the ("old backup") floppy disk from the drive and make it write-protected.
15. Mains voltage and system OFF.



WARNING

After shut-down of the system, there may be about 380 V d.c. present on the intermediate circuit.

Life-threatening electric shock hazard exist.

The voltage will be indicated by LED V24 on PC board D710. The voltage will drop to less than 30 V within about 3 minutes; the LED goes out at about 30 V.

Replacing circuit board D701 (AEC upgrade kit no. 65 52 819 only)

Replace D701 with the new circuit board and the new software PROM IC 7. Use ESD tools.

Change of EPROMs

1. Mains voltage and system OFF.
2. Exchange the remaining EPROMs:

NOTE

Make sure that the PROM is positioned with its semi-circular mark in the same direction as the mark on the actual PC board. Use ESD tools.

⇒ **Control Panel, I 10** on circuit board D740, see wiring diagram, Page 5-10. To have access to circuit board D740, the shielding grid cover should be removed. Loosen the screws on the side holding the grid cover. Remove the grid cover. In case of separate control console remove the larger cover in the bottom of the panel to gain access to the EPROM.

⇒ **Master, J 39** on circuit board D702, Master PC board, see wiring diagram, Page 5-5 and 6-1.

⇒ **Stand, I 9** on CPU board D801, see wiring diagram, (Stand). To have access to CPU board D801, the right side cover (or the complete backcover) should be removed. Loosen the screw (1/Fig. 2) at the top of the stand. Pry loose the plastic strip (2/Fig. 2), using a screwdriver or similar tool. Loosen the screws (3/Fig. 2) now accessible and remove the cover (4/Fig. 2).

⇒ **AEC, IC 7** on circuit board D701 (installation kit no. 65 52 801 only).

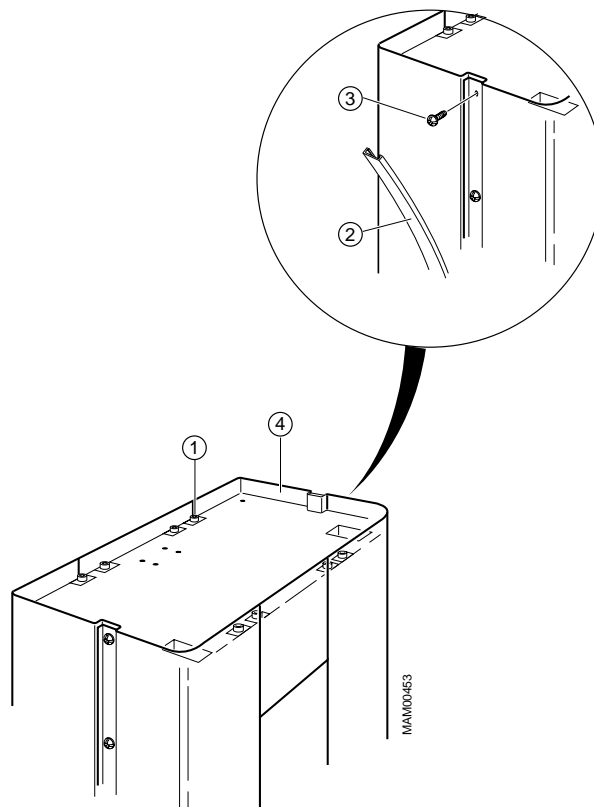


Fig. 2 Removal of right side cover

3. Mains voltage and system ON.
4. An error may now be displayed on the control panel due to the new PROM version. Acknowledge any error by pressing the "lim" button on the control panel. Error 105 may / will be displayed until "Enable / Disable Dose Calculation" is performed, see step 22..

NOTE

Steps 5 to 9 for installation kit no. 65 52 819 only.

5. Start up the **old** service PC program. A question may appear asking for system type and if the MAMMOMAT is a model M1000 also type of collimator. Select correct settings and save with <F2>.

NOTE

Be sure to use the old service PC program. The new program will load incorrect values that might damage the X-ray tube.

6. Take out the old service PC floppy disk and insert the **old backup floppy** disk.
7. In <Mainmenu> select <Backup>, <Copy floppy to installation area> for <Stand> and <Panel> only. Press <ENTER> after each selection to send the backup data.
8. Quit the old service program by pressing <F10>.
9. Start up the new service PC program, enter menu <Configuration>, <System type>. Make sure the system type as well as the Collimator type shown are the correct ones. Press <F2> to save. Proceed from step 13.

NOTE

Steps 10 to 12 for installation kit no. 65 52 801 only.

10. Start up the **new** service PC program. A question may appear asking for system type and if the MAMMOMAT is a model M1000 also type of collimator. Select correct settings and save with <F2>.
11. Take out the new service PC floppy disk and insert the **old backup floppy** disk.
12. In <Mainmenu> select <Backup>, <Copy floppy to installation area> and <All>.
13. If the MAMMOMAT is a model M3000 enter <Main menu>, <Configuration>, <Anode>. If the MAMMOMAT is equipped with the Tungsten Anode function, select <Enable>; if not, select <disable>. Use the space bar to toggle between the options. Press <F2> to save.

NOTE

Anode option is not available in M1000.

14. Acknowledge any errors by pressing the "lim" button on the control panel.
15. If upgrading from a system with a software/firmware version higher than 2.1 and if no error indication appears on the panel; go on to step 16. Otherwise, calibrate the swivel-arm rotation according to Appendix 2 (because there were no backup data for the stand) and return to step 16.
16. In <Mainmenu> select <Configuration> and <Power>. Check that the power values are the same as noted in the Test protocol. (One workstep on Page 7-1).
17. In <Mainmenu> select <Configuration>, <Miscellaneous> and <Cassette loaded check>. Set to OFF during the whole installation. (ON only in the Final Chapter.)

18. Set the switch S2 (SS) on the D702 board to ON (upper position).
19. Quit the new Service Program.
20. Remove the new Service Program floppy and insert the Dose Calculation Program floppy. (These few steps will load the factory default values for HVL, else the ERR 014 may appear. For ERR descriptions see the document SPB7-230.230.114.03...;)
21. Start up the Dose Calculation Program. The username / login-account and password are the same as for the Service Program.
22. In <Mainmenu> select<Enable / Disable Dose Calculation> and use the <space> to toggle between ON / OF. Select and set the desired status. (The factory set default may be <Disabled>, it seems to be worth setting to <Enabled>).
23. In <Mainmenu> select <Configure Tube-specific parameters> and <Factory defaults>. Press <F2> to install factory default parameters.
24. Quit the Dose Calculation Program.
25. Acknowledge any errors by pressing the "lim" button on the control panel.
26. Affix the **mAs / mGy** label over (covering) the "mAs" text on the control and display panel. The usual display of "post-exposure" mAs value will be interrupted by occasional display of the calculated absorbed glandular dose value given in mGray.
27. Mount an object table and check the exposure release by making an mAs exposure. Check that it is a normal exposure without any errors. If error occurs, troubleshoot according to standard procedures.
28. Check that the motorized movements function properly, see Installation and Start-Up instruction, RXB7-230.033.
29. System and mains voltage OFF. Reinstall the shielding grid cover below D704. Then switch the system ON.
30. Start the Service PC Program.
31. Remove the Service Program floppy and insert an empty floppy disk.
32. In <Mainmenu> select <Backup>, <Copy installation area to floppy> and <All>.
33. Remove the floppy disk and label it with new backup, serial No: of the system, version of Service Program and date.
34. Quit the Service Program.



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NOTE

Chapter 8 is not applicable if upgrading a MAMMOMAT 1000 only with OPDOSE.

Preparation of the new backup floppy

1. On the service PC choose the DOS prompt. Create a new directory AEC_inst:
C:\>mkdir AEC_inst
2. Change the working directory to the above:
C:\>cd AEC_inst
3. Copy the supplied "Service PC" floppy to C:
C:\AEC_inst> copy a :*. *
4. Copy the floppy "AEC correction tables" to C:
C:\AEC_inst> copy a:*. *
5. Mark an empty backup floppy with **new backup**, serial number of system, version of service program, and the day's date. Insert this floppy into the drive A.
6. Copy the contents of AEC_inst to A:
C:\AEC_inst> copy *.* a:

Use this floppy for the rest of the installation.

General remark to calibration of kV.

The Dose calculation option uses measurements and source table data to calculate the absorbed glandular dose. Values that can be measured are: the HVL (Half Value Layer) and the Dose Exchange value. To improve the measured values, the kV can (and should) be calibrated first.

kV-adjustment (AEC upgrade kit no. 65 52 819 only)

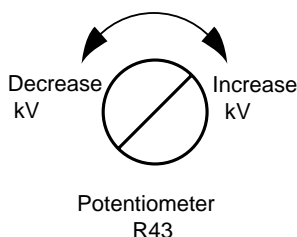
Check the kV as follows:

1. Mains voltage and system OFF.

**WARNING**

After shut-down of the system, there may be about 380 V d.c. present on the intermediate circuit. This will be indicated by LED V24 on PC board D710. The voltage will drop to less than 30 V within about 3 minutes; the LED goes out at about 30 V.

2. Connect DVM between the lower ends of R72 and R73 (on the left side of the high tension plug) on D710 circuit board.
3. Mains voltage and system ON.
4. Set 27 kV and maximum mAs on the control panel.
5. Make an exposure and check that the DVM shows 2.700 ± 0.010 V. Note the values in the kV-adjustment protocol Page T - 2.
6. If necessary, adjust R43 on D702 (Fig. 1) and make another exposure. Note the new values in the kV-adjustment Test protocol.



MAM00528

Fig. 1

NOTE

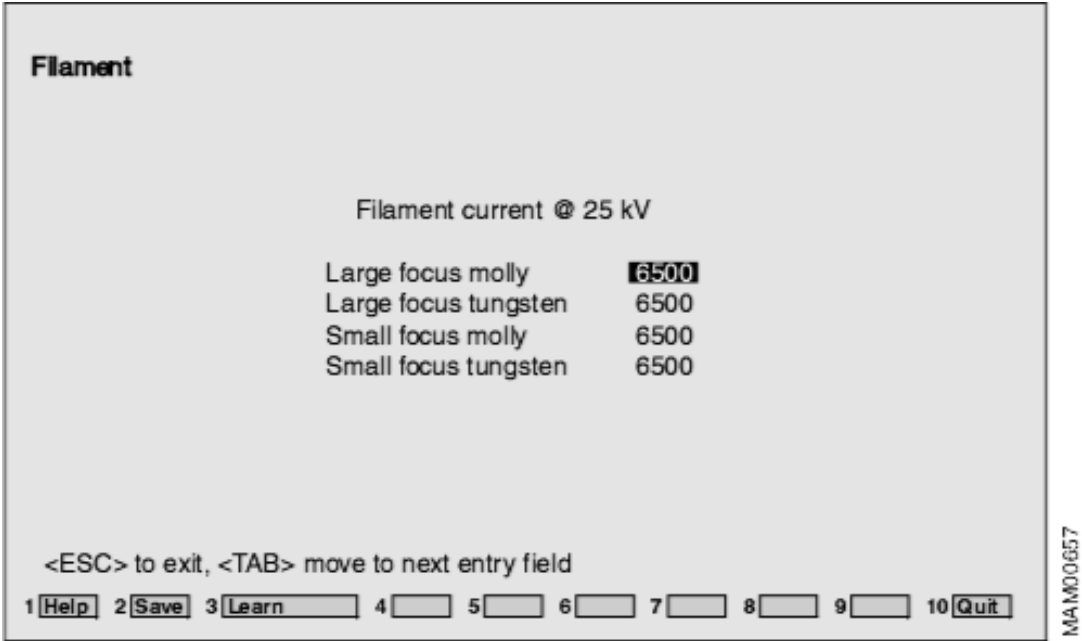
Do not overload the X-ray tube by making too many exposures in a short time.

R43 does not need to be relocked with locking paint.

7. Mains and system OFF.
8. Disconnect DVM from R72 and R73.

Filament (AEC upgrade kit no. 65 52 819 only)

- 1. In <Mainmenu> select <Configuration> and <Filament>.



- 2. Perform Learn filament for available options.
- 3. Note the new values in the Test protocol (Filament).

NOTE	Only settings for Mo are available for M1000.
------	---

Offset compensation (AEC upgrade kit no. 65 52 819 only)

NOTE

Make sure that the “cassette loaded” switch is in position OFF.

MAMMOMAT equipped *with* tungsten anode and:

- One wing: three exposures each are to be made with Mo/Mo and W/Rh set
- Two wings: three exposures with Mo/Mo set on Wing 1 and three exposures with W/Rh set on Wing 2

MAMMOMAT *without* tungsten anode and *with*:

- One wing: three exposures with Mo/Mo
 - Two wings: three exposures with Mo/Mo set on Wing 1 and three exposures with Mo/Mo set on Wing 2
1. Make sure the **new backup floppy** is inserted (not write protected).
 2. Use an object table with grid.
 3. Place a metal plate (part no. 65 52 728) in the cassette opening of the object table, covering the AEC detector.
 4. Place the detector in chestwall position.
 5. In <Mainmenu> select <Service> and <Offset compensation test>.

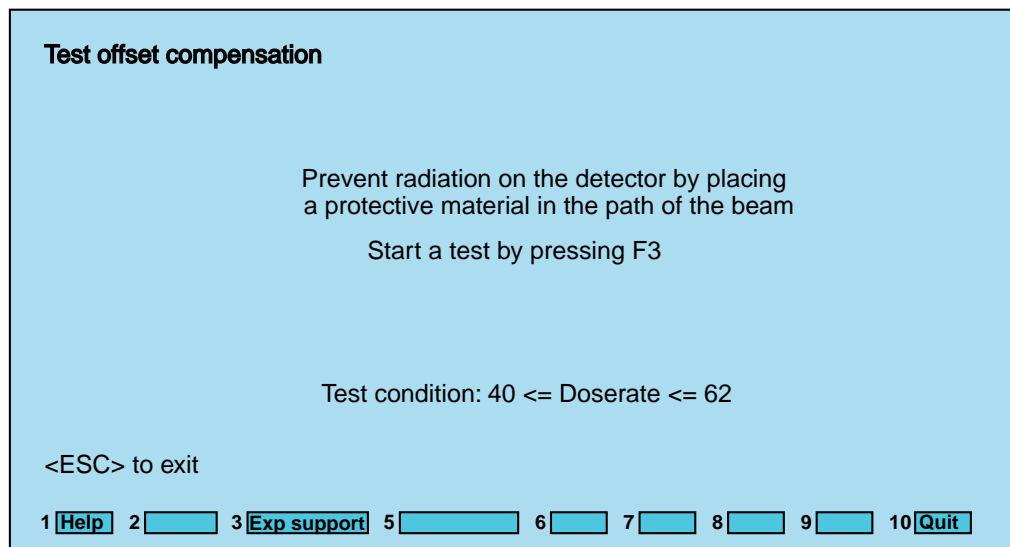
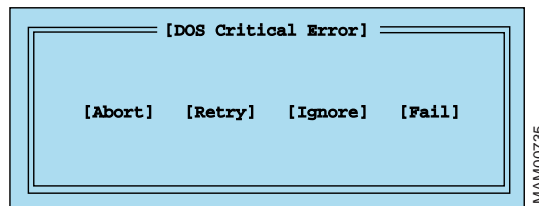


Fig. 2 Service PC-menu, *Test offset compensation* dialog

Error message

If the menu "Dose critical error" should appear, always press "F" (for fail) and check that the correct floppy is inserted and is not write protected.



6. Press <F3> and follow the instructions in the dialogs for exposure.

NOTE

If Er 02X occurs. Exit the offset compensation test in Service PC by pressing Esc. Acknowledge the error by pressing the limit button. Wait until the green lamp on the control panel is lit. In <Mainmenu> select <Service> and <Offset compensation test> and continue the test.

NOTE

Make sure that the correct anode/filter combination and wing are selected, according to the list of alternatives at the top of previous page.



7. The measured dose rate will be displayed on the screen. If the result is OK go on with step 8. If not OK, check that the detector is not mechanically grounded and repeat the test.



8. Make two more exposures with the same Anode/Filter combination, by repeating steps 6 and 7.
9. Repeat steps 6 to 8 until all exposure alternatives, as listed above, are covered.
10. Remove metal plate (part no. 65 52 728).
11. Exit the offset compensation test in service PC by pressing Esc.

Definitions

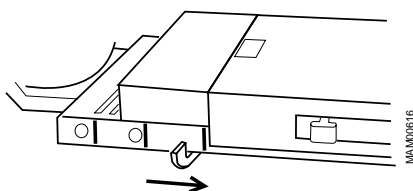
Object table group

An object table group contains all object tables of the same type. There are four groups of object tables - Grid, No grid, Magnification and Stereo. For example the object table group Grid, consists of Grid 18x24 and Grid 24x30.

General conditions

When performing the settings in this chapter, there are some general conditions valid for all settings:

- The detector is to be in chestwall position.



- The AEC calibration plexi must extend at least 10 mm beyond the chestwall edge of the table and be centered, see Fig. 3, Page 8 - 8. Place the AEC calibration plexi in the same position for all exposures.

Calibration conditions

Compression plate must not be used during the detector normalization and calibration of correction tables. From the point sensitivity correction (fine setting) a compression plate may be used.

Reference cassette

Every MAMMOMAT should have a reference cassette. Use this reference cassette where required and for the settings in this chapter. If there is no dedicated reference cassette, pick one cassette, mark it and use it for the settings in this chapter.

Film

When calibrating the correction tables, it is possible to use the same film for each exposure. However, when setting the sensitivity and the sensitivity correction, the operator needs to check the optical density and the film must be exchanged between every exposure.

Mains voltage

Unless otherwise stated, the mains voltage and system must be ON and the new service PC program running, before performing any setting in this chapter.

Sensitivity conditions

- One step (1/8 E.P.) corresponds to approximately 0.06 O.D. with an incremental gamma of 5.
- Measure the optical density on the emulsion side of the film.

Correction of the measured Optical Density (O.D.)

Due to variations in the developing conditions (see also Normal developing conditions) the measured optical density of one specific image might not correspond to the adjusted optical density (sensitivity setting). Therefore the optical density has to be corrected for the variations in the developing conditions.

NOTE

This correction has to be done for
1. fine setting of sensitivity correction
2. setting of sensitivity
3. final testing.

OD _m	The measured optical density in the measuring point, see Fig. 3.
OD _{corr}	The corrected optical density.
OD _{strip}	The O.D. in the step of the sensitometer strip <i>closest</i> to the O.D. of the measuring point.
OD _{strip_ref}	The measured OD _{strip} on first film exposed under normal developing conditions shall be used as OD _{strip_ref} .

Procedure

- For grid/no grid: cover the area far from the chestwall side with metal plate (part no. 65 52 728).
- For magnification: place metal plate (part no. 65 61 026) *inside* the magnification table as close as possible to the cassette to prevent scattered radiation. Cover the area far from the chestwall side.
- Develop all films with a sensitometer strip on the part that was covered by the metal plate (part no. 65 52 728 or part no. 65 61 062).
- Measure the optical density in two places: OD_m (as described in Fig. 3) and OD_{strip} (on the sensitometer strip).
- Calculate the corrected O.D. as follows:

$$OD_{corr} = OD_m + (OD_{strip_ref} - OD_{strip})$$

Normal developing conditions

When measuring the O.D., it is essential that the working conditions are as close to normal as possible. There are several parameters that may effect the results:

- Temperature of developer and dryer
- Feeding and developing speed
- Replenishing speed of developer and fixer (liquids)

If possible, develop the film among other films when the developer is warm and stabilized.

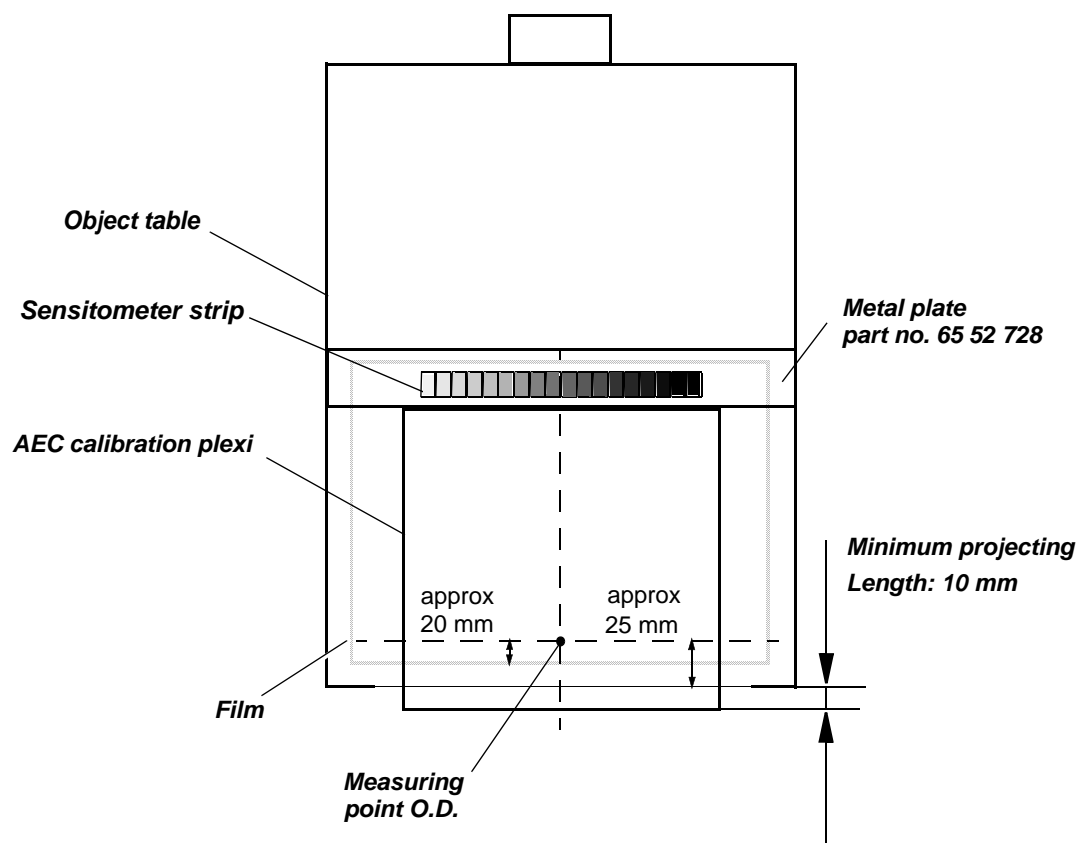
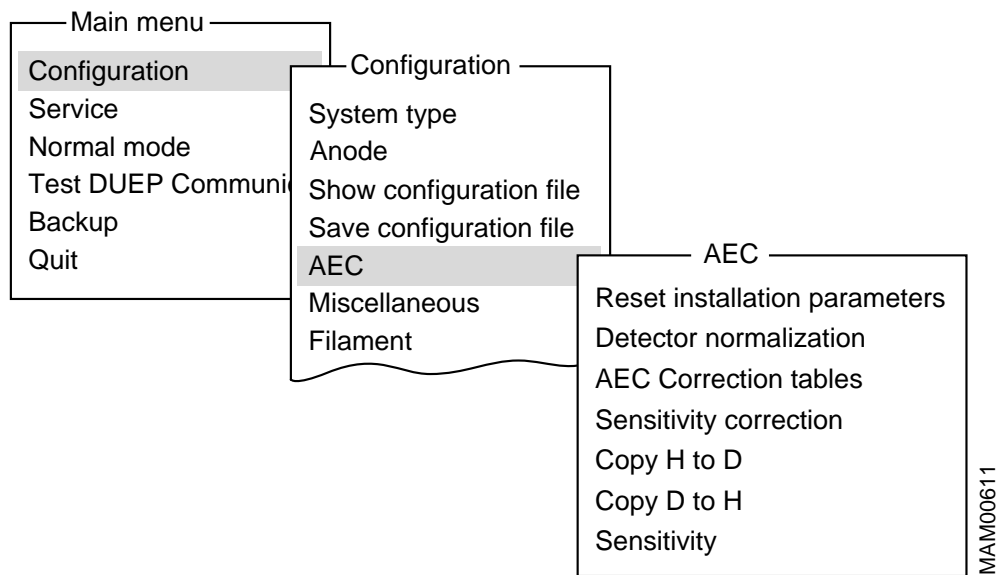


Fig. 3 Position of AEC calibration plexi and film

* Applicable on condition that the detector is placed in chest-wall position.

Overview of work routine



1. "Reset installation parameters (AEC upgrade kit no. 65 52 819 only)" on Page 8 - 10.
2. "Detector normalization (AEC upgrade kit no. 65 52 819 only)" on Page 8 - 12.
3. "AEC Correction tables" on Page 8 - 14.
4. "Sensitivity correction (fine setting)" on Page 8 - 22.
5. "Sensitivity" on Page 8 - 23.
6. "Copy H to D" on Page 8 - 24.

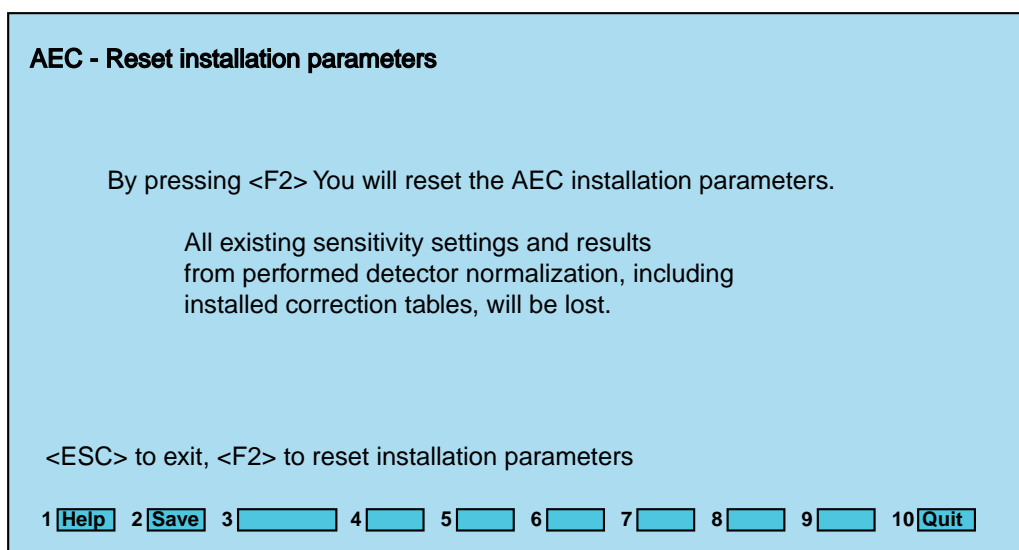
Reset installation parameters (AEC upgrade kit no. 65 52 819 only)

Before starting the first installation of correction tables it is necessary to reset all AEC installation parameters.

NOTE

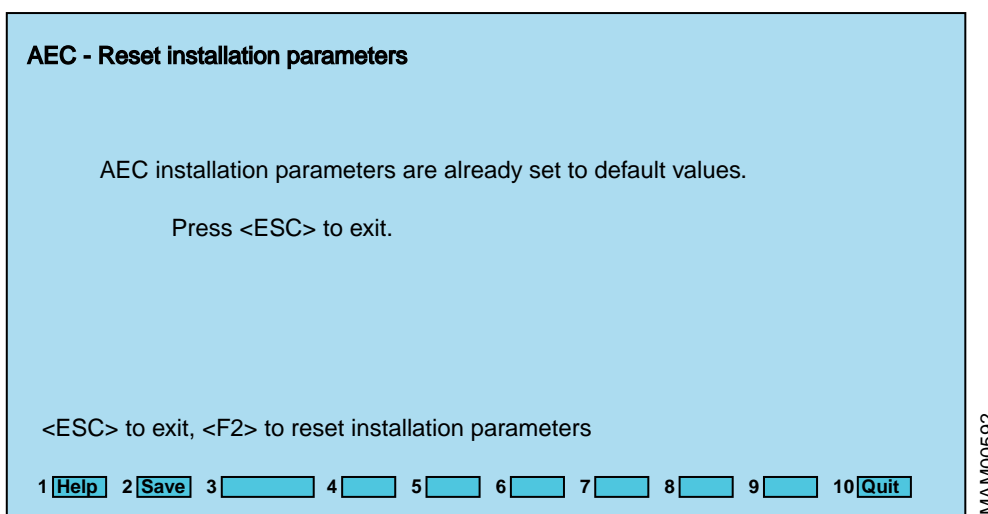
Do not reset the installation parameters if you are only adding an additional correction table - the reset will remove all previously installed correction tables as well as all previous calibration parameters and sensitivity settings.

1. In <Mainmenu> select <Configuration>, <AEC> and <Reset installation parameters>.



2. Press <F2> to start the reset.

If the AEC installation parameters are already set to default values, the message below will appear when pressing <F2>.



DLF switch off

Deactivate the Dynamic Learning Filament (DLF) switch. In <Main menu> select <Configuration>, <Miscellaneous> and <DLF switch>, press space to set switch to OFF. Press <F2> to save.

Increase grid speed

Increase the grid speed. In <Main menu> select <Configuration> and <Grid speed>. Set the following values:

Grid

Grid fast speed time

1500

ms (2.5 s max)

Grid fast speed

90

% of max

Grid slow speed

30

% of max

<ESC> to exit, <TAB> move to next entry field

1

Help

2

Save

3

4

5

6

7

8

9

10

Quit

MAM00761

Detector normalization (AEC upgrade kit no. 65 52 819 only)

The following exposures are to be made:

- with no cassette or film
- with the very same AEC calibration plexi and object table.

It is strongly suggested that you use a Grid 18x24 object table (Bucky).

NOTE

Perform detector normalization for all available wings on the same occasion. Do not use a compression plate.

NOTE

Only wing 2 is available for M1000.

1. Make sure the **new backup floppy** is inserted.
2. In <Mainmenu> select <Configuration>, <AEC> and <Detector normalization>.

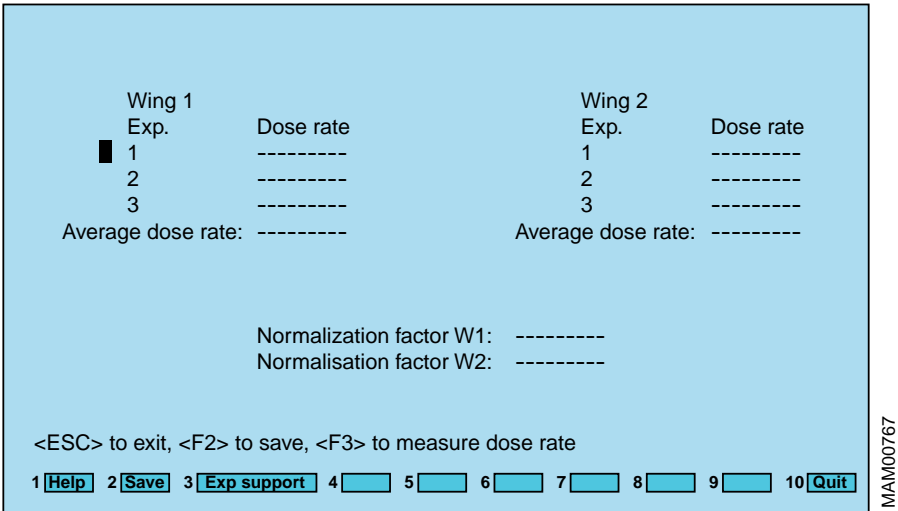


Fig. 4 Average dose rate: Out of the three obtained values, the one that differs the most is ignored. The average dose rate is then calculated based on the remaining two values. Normalization factor: The value of the normalization factor should be between 512 and 2048. If not, ensure that the correct object table and AEC calibration plexi have been



3. Place the cursor by one of the exposures of the wing in use and press <F3> to start the exposure procedure.

Please put x cm of Plexi on the object table.
Perform an exposure and press <ENTER> when ready or <ESC> to cancel.

<ENTER> - ok / <ESC> - cancel

MAM00728

4. Follow the instructions in the message box.

5. After pressing <ENTER> the dialog *Calibration exposure* appears. The Dose rate should now have a value. Save the value with <F2>.

Calibration exposure

Mo/Rh, wing 2

Exp. 1

Dose rate -----

<ESC> to exit, <F2> to save, <F3> to perform exposure

1 Help 2 Save 3 Exp support 4 5 6 7 8 9 10 Quit

MAM00769



6. Repeat steps 3 to 5 for the other two exposures, for the wing in question.

Wing 1		Wing 2	
Exp.	Dose rate	Exp.	Dose rate
1	213,18	1	204.99
2	213,92	2	205.72
3	215,04	3	204.85
Average dose rate: 213,55		Average dose rate: 204,92	
Normalization factor W1: 1067			
Normalization factor W2: 997			

<ESC> to exit, <F2> to save, <F3> to measure dose rate

1 Help 2 Save 3 Exp support 4 5 6 7 8 9 10 Quit

MAM00768

Fig. 5 Example of the final result of a wing calibration

7. If the MAMMOMAT is either a model M1000 or an M3000 configured with one single wing, save the values by pressing <F2>. Otherwise (i.e. M3000 with two wings) proceed to steps number 8 and 9.
8. Bring Wing 2 into the x-ray field. Use the same object table.
9. Repeat steps 3 to 5 for the other three exposures. Save the values by pressing <F2>.



AEC Correction tables

This section will guide you through the following steps:

- Installation of correction tables (F2).
- Calibration of correction tables (F3), including rough setting of sensitivity correction.

The AEC uses one correction table for each Anode/Filter/Speed combination. Each correction table has separate corrections for each object table group (Magnification, Grid, No grid and Stereo).

Installation of AEC correction tables

1. In <Mainmenu> select <Configuration>, <AEC> and <AEC correction tables>. The dashes in the ID column show that no correction table is installed (Fig. 6).

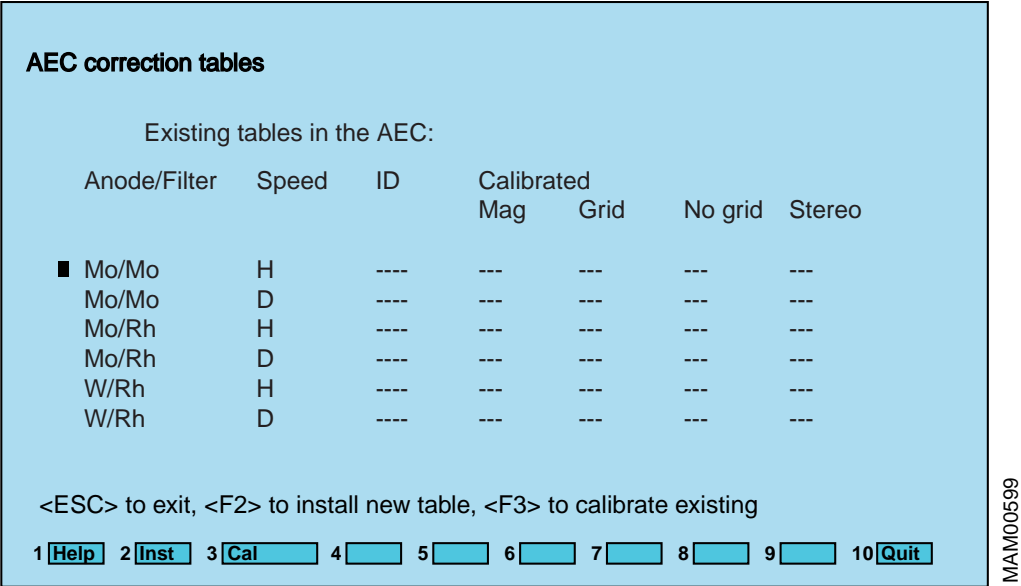


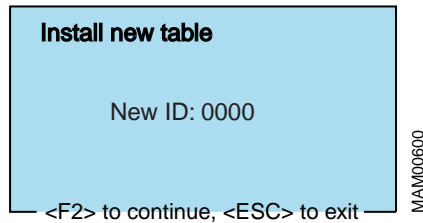
Fig. 6 AEC correction tables

NOTE

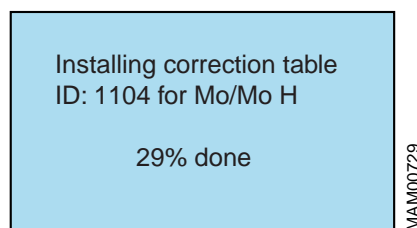
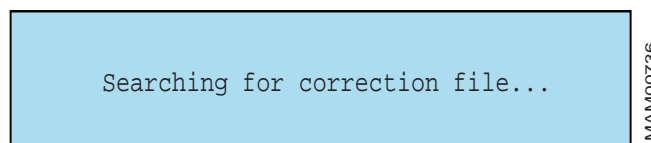
If only one film/screen combination is to be used install correction tables for H only.

2. Make sure that the **new backup floppy** is inserted.
3. Decide for which combination you need to install correction table. (For available identifications for correction tables see Table 1, Page 1 - 1 or the new backup floppy.)

4. Place the cursor by one of the desired Anode/Filter/Speed combinations. Press <F2>.



5. Type the ID number of the new correction table (see Table 1, Page 1 - 1) in the dialog which appears. Press <F2> to install the table. A message box will appear before the correction file has been found.



6. When the transaction of tables is finished, a dialog like Fig. 7, Page 8 - 17 will appear. To complete the calibration, proceed from step 5 of that section.

NOTE

In order to resume calibrating after having quit the program, it is necessary to follow the instructions from step 1 under "Calibrate correction tables" on Page 8 - 16.

Calibrate correction tables

NOTE

The new backup floppy must be inserted.

The Anode/Filter/Speed combinations should be calibrated one at a time.

1. In <Mainmenu> select <Configuration>, <AEC> and <AEC correction tables>.

AEC correction tables

Existing tables in the AEC:

Anode/Filter	Speed	ID	Calibrated Mag	Grid	No grid	Stereo
■ Mo/Mo	H	1104	No	No	No	No
Mo/Mo	D	----	---	---	---	---
Mo/Rh	H	1105	No	No	No	No
Mo/Rh	D	----	---	---	---	---
W/Rh	H	1106	No	No	No	No
W/Rh	D	----	---	---	---	---

<ESC> to exit, <F2> to install new table, <F3> to calibrate existing

1 Help 2 Inst 3 Cal 4 5 6 7 8 9 10 Quit

MAM00730

2. Place the marker by one of the desired Anode/Filter/Speed combinations. Press <F3> to transfer the table.
3. This message box is displayed while the service PC receives the correction table.

Receiving correction table
for Mo/Mo H

63% done

MAM00602

4. When the transfer is done, the dialog *Calibration AEC correction table* appears.

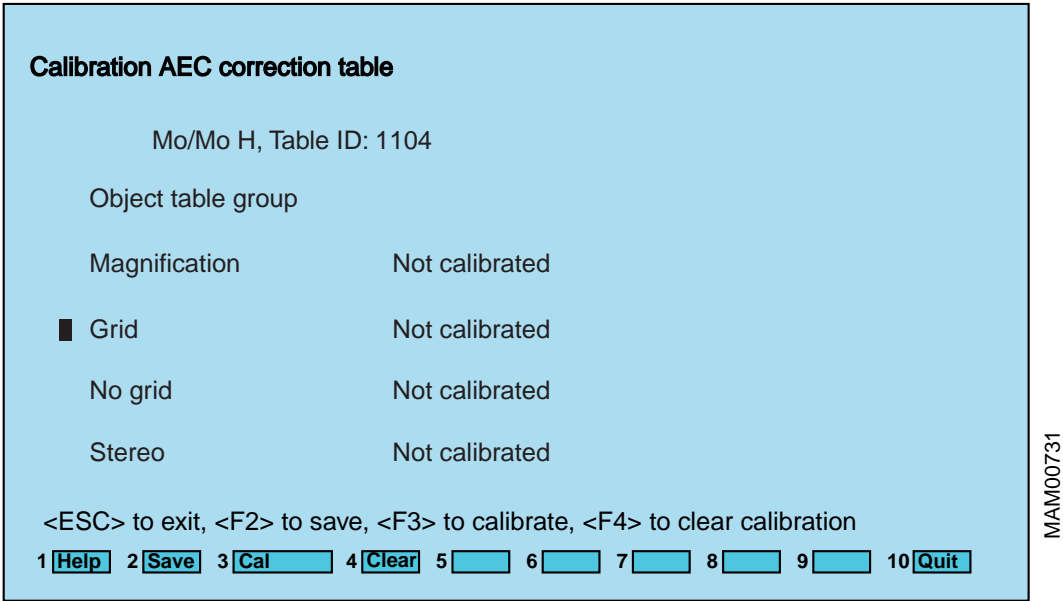
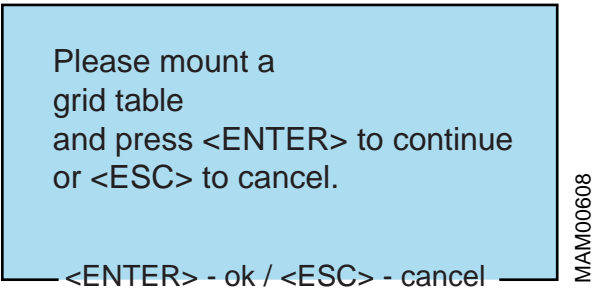


Fig. 7 Dialog *Calibration AEC correction table* shows which object tables, in the current Anode/Filter/Speed combination, have been calibrated.

5. To calibrate the correction table for an object table group, place the cursor in front of the group. Press <F3>.



NOTE	Calibration of correction tables for Stereo is to be done with Stereo angle 0° and with cassette in one of the end positions in the object table.
-------------	--

6. Follow the instructions in the message box above and press <ENTER>.

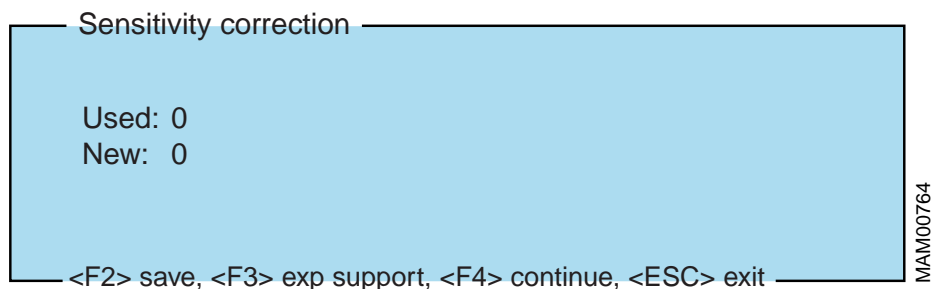
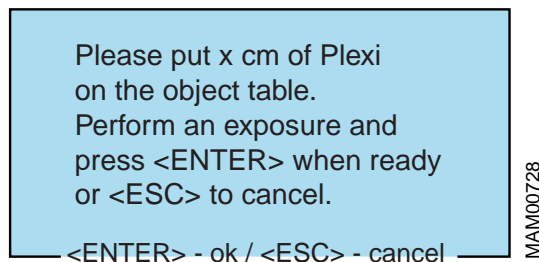


Fig. 8 Dialog *Sensitivity correction*

7. Before calibrating the installed correction tables, it is necessary to make a rough setting of the sensitivity correction for the chosen object table group. Insert the reference cassette, with a new film, in the object table.
- 8.

NOTE	Make sure the new backup floppy is inserted.
NOTE	Do not use a compression plate.

Press <F3>.



9. Follow the instructions in the message box for performing an exposure.
10. Remove the exposed film, make a sensitometer strip and develop the film.
11. Measure O.D. in the measuring point (Fig. 3, Page 8 - 8) as well as OD_{strip} on the sensitometer strip (OD_m and OD_{strip}).
If it is the very first exposed film, use OD_{strip} as OD_{strip_ref} .
Correct the value according to "Correction of the measured Optical Density (O.D.)" on Page 8 - 7.
12. If the value differs from **1.5 O.D.** adjust the values in dialog *AEC - Sensitivity correction* (Fig. 8), save the new Sensitivity correction value with <F2> and repeat the procedures described from step 7.
If the value is satisfactory, proceed by pressing <F4>.

NOTE	One adjustment step of sensitivity correction (1/8 E.P.) corresponds to approximately 0.06 O.D. with an incremental gamma of 5.
-------------	--

NOTE

It is important to use 1.5 O.D. and the specified AEC calibration plexi during the procedures under “Calibrate correction tables”, since measurements are relative to factory results at 1.5 O.D. The O.D. preferred by the customer can be adjusted later either in Sensitivity correction or Sensitivity.

13. Load the cassette with film. Since it will not be developed, the same film can be used for all exposures during the following calibration.

Calibration object table group

Mo/Mo H, Table ID: 1104, Object table group Grid

Exp.	Plexi	kV	Dose rate	Diff. from nominal
1	3	25	-----	-----
2	3	28	-----	-----
3	4	25	-----	-----
4	4	32	-----	-----
5	4	35	-----	-----
6	6	25	-----	-----
7	7	28	-----	-----
8	7	32	-----	-----
9	7	35	-----	-----

<ESC> to exit, <F2> to calibrate & save, <F3> to measure dose rate

1 **Help** 2 **Save** 3 **Exp support** 4 5 6 7 8 9 10 **Quit**

MAM00765

Fig. 9 Dialog *Calibration object table group* shows the dose rates for a number of exposures. The dashed lines below Dose rate indicate that no exposures have been performed yet.

14. To proceed with the calibration, place the cursor by one of the alternatives. Press <F3>.

Please put x cm of Plexi on the object table.
Perform an exposure and press <ENTER> when ready or <ESC> to cancel.

<ENTER> - ok / <ESC> - cancel

MAM00728



15. Follow the instructions in the message box shown.

16. When the exposure is done, the dialog *Calibration exposure* appears with values for Dose rate and Diff. from nominal.

Calibration exposure

Mo/Mo H, Table ID: 1104, Object table group Grid

Exp.	5
Tension	25 kV
PMMA	4 cm
Dose rate	267.23
Diff. from nominal	-21.47%

<ESC> to exit, <F2> to save, <F3> to perform exposure

1 Help 2 Save 3 Exp support 4 5 6 7 8 9 10 Quit

MAM00766

NOTE

If the Diff. from nominal exceeds $\pm 50\%$ ensure that the exposure really has taken place, the thickness of AEC calibration plexi is correct and properly positioned and that the cassette (loaded with film) is inserted and repeat the last exposure. If the difference still exceeds $\pm 50\%$ accept the value and proceed.



17. Save the values with <F2>.
18. Repeat steps 14 to 17 until all exposures are done.
19. When all exposures for one object table group are done, save the values with <F2> in the dialog *Calibration object table group*.
20. The dialog *Calibration AEC correction table* appears. Select the next object table group and repeat steps 5 to 20.
21. When all desired object table groups are calibrated, press <F2> to install the calibrated correction table in the AEC.

Installing correction table
ID: 1104 for Mo/Mo H

29% done

MAM00729

Recalibration of an object table

An already calibrated object table group can be recalibrated.

NOTE	Make sure the new backup floppy is inserted.
-------------	---

1. Repeat the procedure described in steps 1 to 4, Page 8 - 16.
2. To recalibrate a correction table for an object table group, place the cursor in front of the group. Press <F4>. This will reset the existing calibration of the chosen object table group and replace it with the original correction table stored on the floppy.
3. Press <F2> to save.
4. Recalibrate the desired object table group according to the normal procedure, from step 2, Page 8 - 16.

Sensitivity correction (fine setting)

NOTE

New backup floppy must be inserted. The specified AEC calibration plexi must be used.

When all desired object table groups are calibrated, a fine setting of the sensitivity correction should be performed for all available object tables.

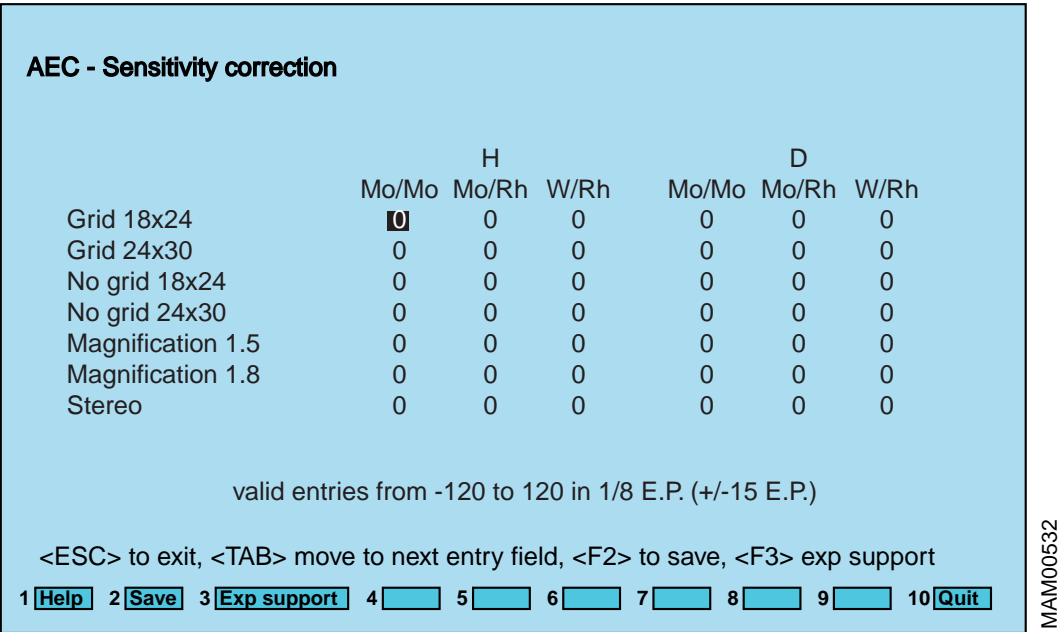


Fig. 10 Set the sensitivity correction for all desired object tables.

1. In <Mainmenu> select <Configuration>, <AEC> and <Sensitivity correction>.
2. Install an object table.
3. Insert the reference cassette, with a new film, in the object table.
4. Select <F3> for support and perform an exposure.



NOTE

From this point forward a compression plate may be used.

5. Remove the exposed film, make a sensitometer strip and develop the film. Measure O.D. in the measuring point and correct the value according to "Correction of the measured Optical Density (O.D.)" on Page 8 - 7.
6. If the value differs from 1.5 O.D. (or by customer preferred) adjust the values in dialog *AEC - Sensitivity correction* (Fig. 10). Repeat the procedure described in steps 2 to 6. Save with <F2>.
7. Repeat this procedure for the other object tables if applicable.

Sensitivity

Adjustment of O.D. for the whole AEC is performed under <Mainmenu>, <Configuration>, <AEC> and <Sensitivity>.

AEC - Sensitivity

H

D

Sensitivity 0

0

valid entries from -64 to 64 in 1/8 E.P. (+/-8 E.P.)

<ESC> to exit, <TAB> move to next entry field

1 Help

2 Save

3

5

6

7

8

9

10 Quit

MAM00654

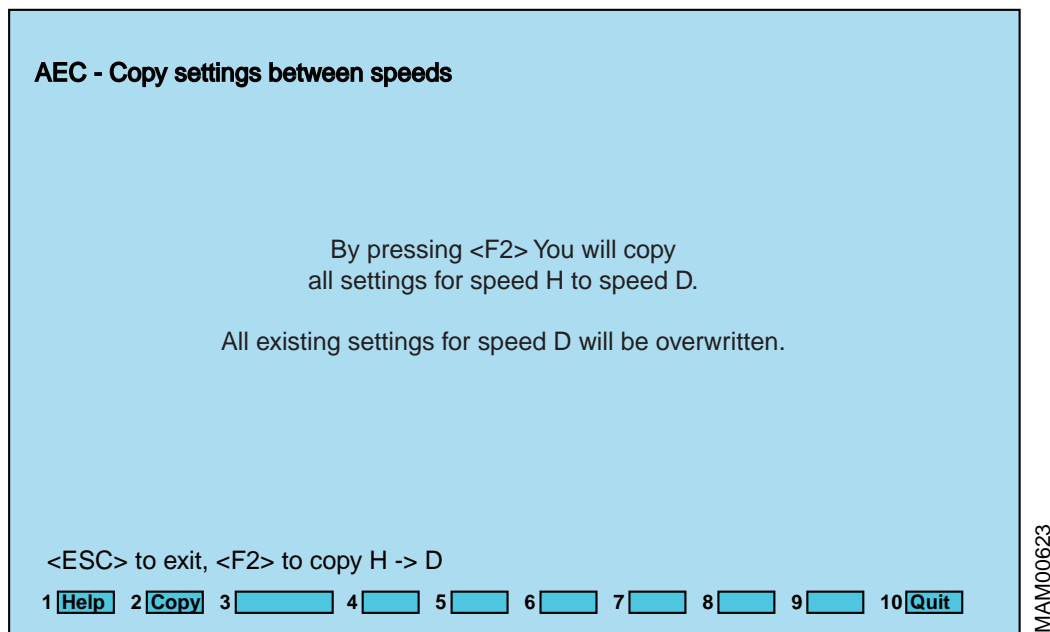
NOTE

The O.D. preferred by the customer can be set with this function.
The customer’s own phantom(s) can also be used.

Copy H to D

If you do not install correction tables for different film/screen combinations on H and D respectively, it is important to have the same settings on both H and D. Perform a back-up to assure that the calibration cannot be lost.

1. Make sure the new backup floppy is inserted.
2. In <Mainmenu> select <Backup>, <Copy installation area to floppy> and <All>.
3. In <Mainmenu>, <Configuration> and <AEC> select <Copy H to D>.



4. Press <F2>. A dialog will appear during copying from H to D. When copying is completed the message "Transfer successful" appears.

NOTE

For M1000 this upgrade enables Panel Programming (OPDOSE).

1. If the mains voltage and system are ON and the new service PC program is running, go to step 4, else go to step 2.
2. Mains voltage and system ON.
3. Start up the new service PC program.
4. In <Mainmenu> select <Configuration>, <Miscellaneous> and <Panel programming>. The panel program switch must be ON. Save with <F2>.
5. In <Mainmenu> select <Configuration>, <Miscellaneous> and <Auto limits>. Make sure the values are Program 1 30 mm, Program 2 45 mm and Program 3 60 mm or the values desired by the customer. Change if needed and then save with <F2>.
6. Set kV (1/Fig. 1), density (2/Fig. 1), H/D (3/Fig. 1) and anode/filter combination (4/Fig. 1), for one of the programs according to the test values previously noted in the protocol, except density correction which should be set to 0. For M1000 we recommend the factory settings (Page 9 - 2).
7. Save the program parameters if needed by pressing the store button (6/Fig. 1) and then the program button (5/Fig. 1). Keep both buttons pressed until the program button stops flashing (approx. 5 s). Repeat the procedure in step 5 to 6 for the remaining programs.

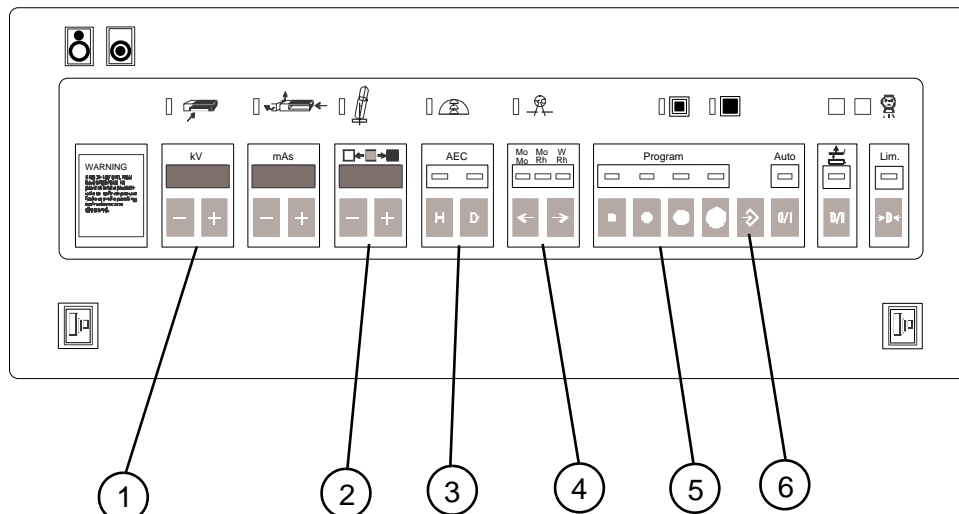


Fig. 1

MAM00018

9 - 2 Reinstall/Install program parameters for OPDOSE

Factory settings

Changes can be made with the service PC program (**Configuration, Miscellaneous, Auto limits**).

Thickness	kV	Anode/filter combination
≥ 61 mm	26	W / Rh
46 - 60 mm	27	Mo / Rh
31 - 45 mm	27	Mo / Mo
0 - 30 mm	26	Mo / Mo

Fig. 2 Installations with filter disc Mo 0.030 / Rh 0.025 / Rh 0.050

Thickness	kV	Anode/filter combination
≥ 61 mm	28	Mo / Rh
46 - 60 mm	27	Mo / Rh
31 - 45 mm	27	Mo / Mo
0 - 30 mm	26	Mo / Mo

Fig. 3 Installations with filter disc Mo 0.030 / Rh 0.025

Thickness	kV	Anode/filter combination
≥ 61 mm	29	Mo / Mo
46 - 60 mm	28	Mo / Mo
31 - 45 mm	27	Mo / Mo
0 - 30 mm	26	Mo / Mo

Fig. 4 Mammomat 1000 installations with single filter from serial no. 7400 / software version 4.2

Testing the AEC-function (not applicable if upgrading M1000 only with OPDOSE)

AEC performance test

Testing of the AEC-function is to be performed according to the test protocol, and for the object tables in question. (Should error codes Er013 or Er450 appear; change to the AEC calibration plexi which is 1 cm thinner.) Mark the exposed films with exposure conditions and store them together with the test protocol.

NOTE

Tolerance only valid for film/screen combinations listed in Table 1 under "General" on Page 1 - 1.

These limits apply for film with max. incremental gamma 5.0.

NOTE

It is important to make sensitometer exposures on all films to be measured.

Testing OPDOSE

1. If the mains voltage and system are ON and the new service PC program is running, go to step 4, else go to step 2.
2. Mains voltage and system ON.
3. Start up the new service PC program.
4. Mount an 18x24 cm compression plate to the MAMMOMAT 3000.
5. Select a thickness of AEC calibration plexi, that is within the thickness interval of the program to be tested. The thickness intervals can be found in <Mainmenu>, <Configuration>, <Miscellaneous> and <Auto limits>. For more information about Auto limits, see Chapter "Miscellaneous -> Auto limits" in the service manual "Service Program" for MAMMOMAT 3000.
6. Select AUTO on control panel.
7. Place the AEC calibration plexi on the object table in question and compress to 6 kg or more.
8. Check that the correct program is blinking on the control panel. Select the program by pressing the corresponding program button on the control panel.
9. Check the optical density (O.D.) by making exposure on film. The O.D. shall be as close to 1,5 as possible (or the density preferred by customer). If necessary adjust density correction on control panel. Save by pressing the store button and then the program button. Keep both buttons pressed until the program button stops flashing.
10. Repeat the procedure described in steps 5 to 9 for the other used programs.
11. Note the OPDOSE settings in the attached test protocol.

Printer configuration

If a regular graphic printer is connected to the MAMMOMAT, it can be configured to print onto the labels, id est: to show also the data about the calculated glandular dose absorbed during the recent exposure. This will be printed in addition to other usual patient data. The information on how to configure the printer settings can be taken from the document SPB7-230.812.03... "Printer option configuration". The prerequisites, among others the applicable Label configuration program disk, MatNo.: 66 09 544, have to be met.

Flasher configuration (Network ID Camera)

If a flasher is connected to the MAMMOMAT, it can be configured to flash the above mentioned value of the calculated glandular dose absorbed during the recent exposure onto the film in cassette. Consult the documentation found on the CS-Intranet in Section "Network ID Camera, under Product information > SP Systems > Mammography.

Installation of measured values

If the hospital's medical physicist has measured both, the Half Value Layer (HVL) value and the Dose Exchange data according to the information in the document "Radiographic Handbook, Dose Calculation System", these values can be installed (instead of the factory default values) as follows:

1. Open the generator as usually and connect the Service PC
2. Insert the Dose calculation Program floppy and run the program
3. In <Mainmenu> select <Configure tube-specific parameters>, <HVL values> and enter the measured values. Press <F2> to save..

NOTICE

If the Dose Calculation Program does not accept the entered values, the measured values might be faulty - the system considers them as out of range.

Repeat the measuring procedure, or install the factory default values.

4. In <Mainmenu> select <Configure tube-specific parameters>, <Dose exchange factors> and enter the measured values. Press <F2> to save.
5. Quit the Dose Calculation Program.
6. Mount an object table and check the exposure release by making an mAs exposure. Check that it is a normal exposure without any errors. If error occurs, troubleshoot according to standard procedures.
7. Remove the Dose Calculation Program floppy and insert the new Service Program floppy.
8. Start the new Service PC Program.

Final procedure

1. If the mains voltage and system are ON and the new service PC program is running, go to step 4, else go to step 2.
2. Mains voltage and system ON.
3. Start up the new service PC program.
4. Set the cassette loaded switch ON.

NOTE

Steps 5 and 6 not applicable if upgrading M1000 only with OPDOSE.

5. Activate the DLF switch. In <Main menu> select <Configuration>, <Miscellaneous> and <DLF switch>, press space to set switch to ON. Press <F2> to save. (
6. Reduce the grid speed. In <Main menu> select <Configuration> and <Grid speed>. Set the following values:

Grid

Grid fast speed time	500	ms (2.5 s max)
Grid fast speed	80	% of max
Grid slow speed	20	% of max

<ESC> to exit, <TAB> move to next entry field

1 Help
2 Save
3
4
5
6
7
8
9
10 Quit

MAM00762

7. In <Main menu> select <Service> and <Delete error buffer>. Press <y> to delete.
8. Make sure the **new backup floppy** is inserted, marked with serial number of system and version of service program.
9. In <Mainmenu> select <Configuration>, <Save config file>. Press <F2> to save.
10. In <Mainmenu> select <Backup>, <Copy installation area to floppy> and <All>.
11. Mains voltage and system OFF.
12. Disconnect the service PC.

13.

NOTE

For the AEC upgrade kit no. 65 52 819 only.

Place the label with part no. and serial no. at the right side inside the generator (Fig. 1). (Remember the duty of confirming the installation of an IVK.).

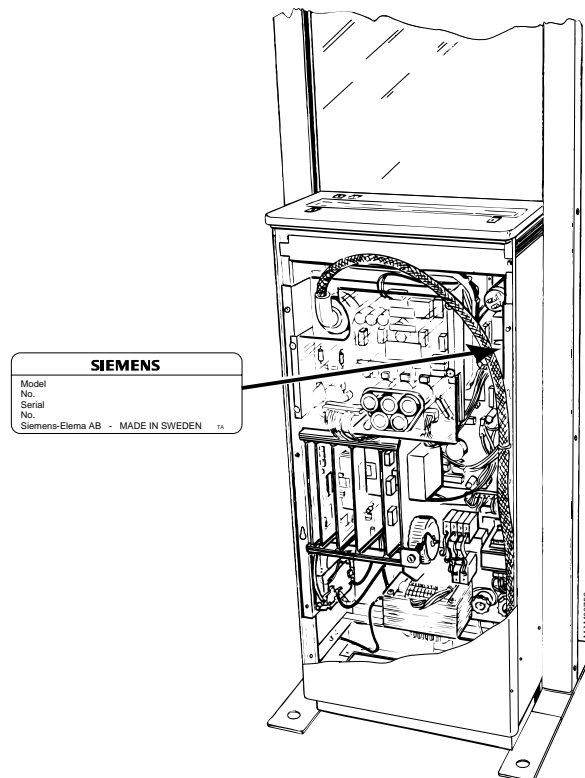


Fig. 1

14. Mount the rear side cover (or complete backcover) onto the stand.

NOTE

Make sure the screws with contact washers are fastened on the top of the stand.

15. Fit the front cover to the generator and fasten it.

NOTE

Make sure that all eight contact washers (four on either side) are used again as in the original assembly to establish protective ground connection. The washers must be functional and the screws must be securely tightened (see also Installation and Start-Up Instructions).

NOTE

Keep all floppy disks in the plastic folder (part no. 61 62 411), which is included in the upgrade kit, with other documentation for the MAMMOMAT in question.

NOTE**Step 16 for installation kit no. 65 52 819 only.**

16. The metal plates (part no. 65 52 728 and 65 61 026) are to remain with the customer, for future use. Keep them with other material and documentation for the MAMMOMAT in question.
17. Disposal of removed parts is to be taken care of according to local public legal directives.
18. The old document "Service Program" is to be replaced by the new one.

Page	Chapter	Change
1-3	Components included	Part numbers for - Floppy disk with Service PC Program - Stand PROM D801 / I 9 - Generator PROM kit and - Installation Instructions are replaced.
1-5	Components included	Part numbers for - Floppy disk with Service PC Program - Stand PROM D801 / I 9 - Generator PROM kit and - Installation Instructions are replaced.
8-6	Calibration conditions	Text is new.
8-12	Detector normalization (installation kit no. 65 52 819 only)	First note is rewritten.
8-18	Calibrate correction tables	Second note is new.
8-20	Calibrate correction tables	The note is rewritten.
8-22	Sensitivity correction (fine setting)	New note in step 4.

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MAMMOMAT Serial number

Name of installer





Installation date

Backup of existing system

Use these two protocols with the instructions in "Backup of existing system -" on Page 7 - 1 and onward.

Anode	Power (kW)
Large focus molly	
Large focus tungsten	
Small focus molly	
Small focus tungsten	

The customer's own OPDOSE settings:

Program buttons	kV	Density correction	speed button (H or D)	anode/filter combination	Breast thickness
					
					
					
					

Auto limits	
Program 1	
Program 2	
Program 3	

Programming

kV-adjustment

Use this protocol with the instructions in "kV-adjustment (AEC upgrade kit no. 65 52 819 only)" on Page 8 - 2.

	Measured value with DVM
Before adjustment	
After adjustment	

Filament

Use this protocol with the instructions in "Filament (AEC upgrade kit no. 65 52 819 only)" on Page 8 - 3.

Anode	Filament current
Large focus molly	
Large focus tungsten	
Small focus molly	
Small focus tungsten	

AEC performance test

To be performed for the object tables, wings, and speeds in question.

ΔOD_{corr} = the difference between the two measured OD_{corr} values in each case. For further information see "Definitions" under "Configuration of the AEC".

*Should error codes Er013 or Er450 appear; change to AEC calibration plexi which is 1 cm thinner.

If both speed H and speed D are to be tested, copy the test protocol.

	Film		Screen	
	Manufacturer	Type	Manufacturer	Type
H				
D				

Speed used for the tests below (H/D)

OD_{strip_ref}

Step no.	OD

Wing 1 M3000, Wing 2 M1000

For applicable anode/filter combinations.

Grid Table 18x24 (Bucky)		mAs	OD	OD_{strip}	OD_{corr}
Mo/Mo	25 kV, 6 cm Plexi*				
Mo/Mo	32 kV, 2 cm Plexi				

Tolerances: $\Delta OD_{corr} \leq 0.30$ absolute

ΔOD_{corr}

Grid Table 18x24 (Bucky)		mAs	OD	OD_{strip}	OD_{corr}
Mo/Rh	26 kV, 6 cm Plexi*				
Mo/Rh	32 kV, 2 cm Plexi				

Tolerances: $\Delta OD_{corr} \leq 0.30$ absolute

ΔOD_{corr}

Grid Table 18x24 (Bucky)		mAs	OD	OD _{strip}	OD _{corr}
W/Rh	25 kV, 6 cm Plexi*				
W/Rh	32 kV, 2 cm Plexi				

Tolerances: $\Delta OD_{corr} \leq 0.30$ absolute

ΔOD_{corr}

Magnification Table		mAs	OD	OD _{strip}	OD _{corr}
Mo/Mo	25 kV, 5 cm Plexi*				
Mo/Mo	32 kV, 2 cm Plexi				

Tolerances: $\Delta OD_{corr} \leq 0.30$ absolute

ΔOD_{corr}

Magnification Table		mAs	OD	OD _{strip}	OD _{corr}
Mo/Rh	26 kV, 5 cm Plexi*				
Mo/Rh	32 kV, 2 cm Plexi				

Tolerances: $\Delta OD_{corr} \leq 0.30$ absolute

ΔOD_{corr}

Magnification Table		mAs	OD	OD _{strip}	OD _{corr}
W/Rh	25 kV, 5 cm Plexi*				
W/Rh	32 kV, 2 cm Plexi				

Tolerances: $\Delta OD_{corr} \leq 0.30$ absolute

ΔOD_{corr}

Stereotactic Table		mAs	OD	OD _{strip}	OD _{corr}
Mo/Mo	25 kV, 6 cm Plexi*				
Mo/Mo	32 kV, 2 cm Plexi				

Tolerances: $\Delta OD_{corr} \leq 0.45$ absolute

ΔOD_{corr}

Stereotactic Table		mAs	OD	OD _{strip}	OD _{corr}
Mo/Rh	26 kV, 6 cm Plexi*				
Mo/Rh	32 kV, 2 cm Plexi				

Tolerances: $\Delta OD_{corr} \leq 0.45$ absolute

ΔOD_{corr}

Stereotactic Table		mAs	OD	OD _{strip}	OD _{corr}
W/Rh	25 kV, 6 cm Plexi*				
W/Rh	32 kV, 2 cm Plexi				

Tolerances: $\Delta OD_{corr} \leq 0.45$ absolute

ΔOD_{corr}

Wing 2 M3000





Grid Table 18x24 (Bucky)		mAs	OD	OD _{strip}	OD _{corr}
Mo/Mo	25 kV, 6 cm Plexi*				
Mo/Mo	32 kV, 2 cm Plexi				

Tolerances: $\Delta OD_{corr} \leq 0.30$ absolute

ΔOD_{corr}

OPDOSE settings

Use this protocol with the instructions in "Testing OPDOSE" on Page 10 - 2

	kV	Density correction	Speed button (H or D)	Anode/filter combination	Breast thickness	OD	OD _{strip}	OD _{corr}
								
								
								
								

Polarity change of the stereo lever switch

For MAMMOMAT 3000 with serial number lower than 2056

1. Mains voltage and system OFF.
2. Remove the right rear side cover (or rear cover if not separate rear side covers) from the stand, see Installation and Start-Up Instructions for MAMMOMAT 3000.
3. For MAMMOMAT 3000 with serial number lower than 2056, remove the shaft covers from the swivel-arm system. Check that the blue wire is connected to pin 2 of the stereo-lever switch S860 (switch for stereotactic or normal mode). If not, it is necessary to change the polarity of the switch by disconnecting the blue wire from pin 3 and soldering it to pin 2, see Fig. 1. To facilitate the soldering, loosen the nuts and take out the switch.

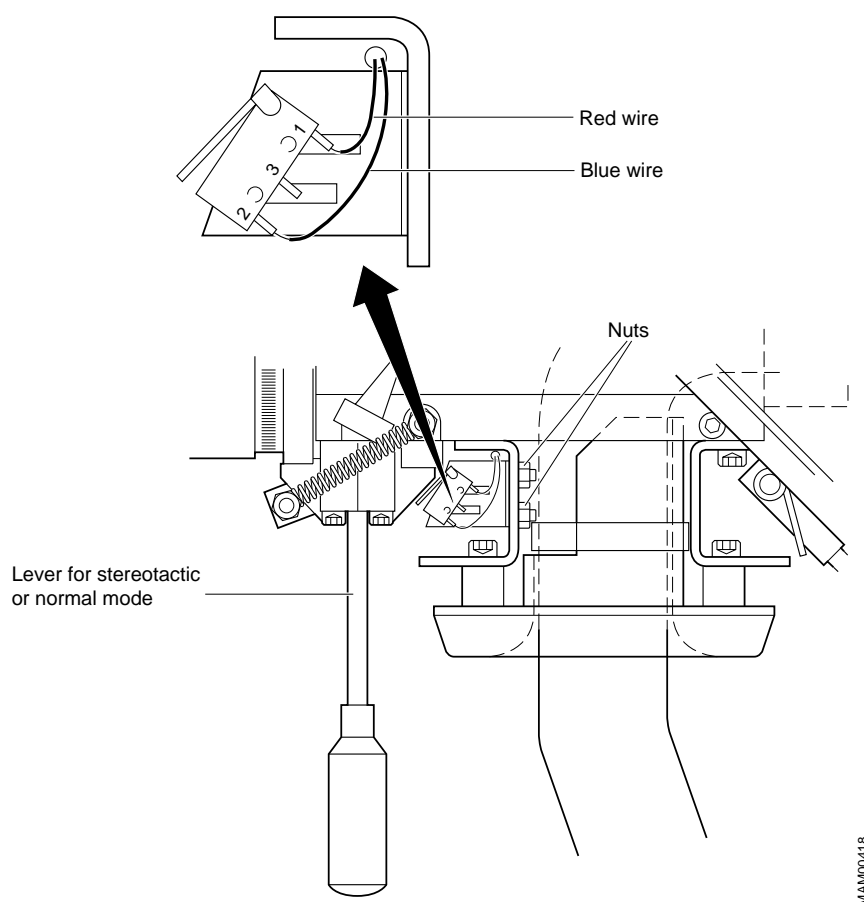


Fig. 1 Changing polarity of the stereo-lever switch

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Calibration of the swivel-arm rotation

1. Mains voltage and system ON.
2. Insert the new service PC program.
3. Select <Mainmenu>, <Configuration>, <Rotation> and <Calibration>, see Fig. 1

Rotation calibration					
Angle	+135	030A	Preset angle	0	00
Angle	-180	005C	Preset angle	90	FF
Angle	-165	007D	Angle	-60	0161
Angle	-150	009D	Angle	-45	0182
Angle	-135	00BE	Angle	-30	01A3
Angle	-120	00DF	Angle	-15	01C3
Angle	-105	00FF	Angle	0	01E4
Angle	-90	0120	Angle	+15	0205
Angle	-75	0141	Angle	+30	0225
			Angle	+45	0246
			Angle	+60	0267
			Angle	+75	0287
			Angle	+90	02A8
			Angle	+105	02C9
			Angle	+120	02E9

<ESC> to exit, <F2> to install tables, <ENTER> to refresh actual version info

1 [Help] 2 [Install] 3 [Calibrate] 5 [Calculate] 6 [] 7 [] 8 [] 9 [] 10 [Quit]

MAM00420

Fig. 1 Service PC-menu, *Rotation calibration* dialog

- <F1> Displays a help text.
- <F2> Saves the values from the entry fields in the electronics of the stand.
- <F3> Measures the value for the highlighted entry field.
- <F5> Calculates theoretical values for all 15° steps from -165° to +120° based on the values in the -180° and +135° entry fields.
- <F10> Quit the menu.

4. Calibrate the rotation angles as described below:

Preset Angle 0°

Highlight the entry field, set the preset angle potentiometer to minimum (fully counter-clockwise) and calibrate with <F3>, <F4>. Save with <F2>.

Preset Angle 90°

Highlight the entry field, set the preset angle potentiometer to maximum (fully clockwise) and calibrate with <F3>, <F4>. Save with <F2>.

Preparation for angle calibration

Prior to calibrating the angles, highlight +135° and enter 03FF, highlight -180° and enter 0000, press <F5> followed by <F4>. Save with <F2>.

Angle +135°

Highlight +135°. Run the rotation motor to approx. +135° (near the CW stop) and move the stereo lever fully to stereo position. If necessary, rotate the head slightly with the motor until the lever can be fully engaged. Rotate the head upwards (towards 0°) to the stereo stop and back to the centre position until it stops. Calibrate the value with <F3> followed by <F4>. Move the stereo lever back to normal mode.

Angle -180°

Highlight -180°. Run the rotation motor to approx. -180° (near the CCW stop) and move the stereo lever fully to stereo position. If necessary, rotate the head slightly until the lever can be fully engaged. Rotate the head upwards (towards 0°) to the stereo stop and back to the centre position until it stops. Calibrate the value with <F3> followed by <F4>. Move the stereo lever back to normal mode.

Press <F5> followed by <F4> to recalculate approximate values for the angles prior to calibration of the remaining angles. Save with <F2>.

Angle -165° to +120°

Highlight -165°. Run the rotation motor to approx. -165° and move the stereo lever fully to stereo position. If necessary, rotate the head slightly until the lever can be fully engaged. Rotate the head upwards (towards 0°) to the stereo stop and back to the centre position until it stops. Calibrate the value with <F3> followed by <F4>.

Move the stereo lever back to normal mode and run the rotation motor to the next position, -150°. Highlight -150° and calibrate as above. Calibrate all the remaining values in the table in the same manner. It is sufficient to calibrate each value with <F3>, <F4> and save all the values afterwards with <F2>.

Check 0° and all 15° steps from 0° to ±90° for proper stereo lever operation by setting the preset angle control to 15°, 30°, etc. and running the rotation motor to both plus and minus angles. 0° is checked by allowing the head to stop when going from positive angle values to negative angle values and vice-versa. Recalibrate any angle which needs improvement by highlighting it and calibrating as above. Remember to save <F2> after performing a recalibration.

NOTE

The angles must be reprogrammed if the tube angle pot. R803, or the CPU D801 is changed.